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ABSTRACT

A survey, presented in looseleaf handbook format, reviews a number of ideas about educational development, technology, change, and the improvement of learning. Its primary focus is on the situation in developing countries. The materials presented are largely descriptive--going from theory to planning, and then on to case studies of educational technology in action today. The case studies are of El Salvador, Niger, American Samoa, and more briefly Mexico, Colombia, and Singapore. The results of El Salvador's experience in educational reform using instructional technology are the basis of some projected cost estimates. Sources of information and assistance on educational technology in many countries are listed, and an annotated bibliography of books and periodicals is also provided. (JY)

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EDUCATIONAL TECHNOLOGY AND THE DEVELOPING COUNTRIES

A Handbook

Draft of
March 15, 1972

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NEW YORK OFFICE: 437 MADISON AVE., NEW YORK, N. Y. 10022
WASHINGTON OFFICE: 1424 16TH ST., N.W. WASH., D.C. 20036

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STUDIES IN EDUCATIONAL TECHNOLOGY FOR DEVELOPMENT

U. S. Agency for International Development
Bureau for Technical Assistance
Office of Education and
Human Resources
Washington, D.C.

This handoook, together with its associated film and other related sources of basic information on educational technology, is one of a series of studies directed by AID/Washington's Bureau for Technical Assistance. These studies are designed to serve planners in the developing nations in exploring the potential (and limits) of educational technology for achieving fundamental educational and human resource development objectives. They are in support of Section 220 of AID's legislation.

Other studies in this program at present include:

- The evaluation of the El Salvador educational reform program
- Key research practices in educational technology for development
- New strategies in communications for social development
- Predeployment preparation for educational satellite and similar systems
- Educational implications of educational satellite and alternative systems
- Case studies of intermediate-cost technologies

Comments on this handbook and related activities should be directed to:

Dr. Clifford H. Block
Educational Technology Coordinator
Agency for International Development
Washington, D. C. 20523

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EDUCATIONAL TECHNOLOGY AND THE DEVELOPING COUNTRIES

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A Handbook

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PREFACE

This handbook presents a number of ideas about educational development, technology, change, and the improvement of learning. The primary focus is on the situation in developing countries. The material presented is largely descriptive -- going from theory to planning, and then on to case studies of educational technology in action today.

The handbook has been put together purposely in looseleaf form and with tabs. For some readers, the case studies will be the most useful or important part of this document. For others, the sources of information and assistance will be of the greatest interest. In any event, any portion of the handbook can be extracted from the binder and used separately, photocopied, or otherwise duplicated in multiple copies.

In addition, the Academy's Information Center on Instructional Technology intends to update this handbook from time to time and to provide replacement pages or additional pages as new material and data become available. We will appreciate, therefore, comments from the AID field staff and educators in developing countries on additional materials that might be included, new information that has been made available, and new developments that have occurred. These will be incorporated into revisions of this document as soon as possible.

Additional copies of this handbook can be obtained from Sidney G. Tickton, Academy for Educational Development, 1424 Sixteenth Street, N.W., Washington, D. C. 20036, or Clifford H. Block, Educational Technology Coordinator, Agency for International Development, Washington, D. C. 20523.

Sidney G. Tickton

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I

I. Introduction: Crisis and Change

The purpose of this handbook is to present certain ideas about educational improvement and change that could help meet educational problems that are critical everywhere.

All countries of the world, whatever their stage of economic development, are confronted by a crisis in education. While the problems facing "advanced" (i.e., industrialized) countries are serious, they appear minor compared to those facing developing nations.

The crisis makes itself felt in every facet of education in the developing world, including these:

Enrollment: The number of children who are in school continues to rise, as the result both of population increases and the growing public demand for education. In Asia and Latin America, school enrollment more than doubled from 1950 to 1964. In African countries it tripled. Yet UNESCO reports a concomitant increase in the number of children not getting even a basic education.

In many countries of Asia, Africa, Latin America, and the Middle East, illiteracy is actually increasing since school enrollment, expanding as it is, cannot keep pace with school-age population growth. In 1970 UNESCO estimated the world's adult illiterates numbered 750 million. Some predict this figure will increase at a rate of 20 million a year.

Since schools cannot be built nor teachers trained fast enough to provide the quantity of education needed, existing classrooms have become more and more overcrowded -- with corresponding detriment to the quality of education. Dropout rates -- heaviest during the first three or four grades -- have soared. Even in countries that provide adequately for elementary education, provision for the upper grades is usually so poor that students are forced to drop out. The result is a growing number of people who cannot keep pace with today's complex world, living in societies struggling to survive and prosper.

Costs: The crisis in enrollment is part of the crisis in finance. Countries now must spend more each year on education even to maintain the status quo. The costs of education are rising -- yet education, as traditionally structured, cannot emulate industry and offset rising costs with rising productivity; education is labor-intensive, with teachers salaries accounting for the bulk of the annual budget. Today expenditures for education in many developing countries have been stretched to the limit.

Teachers: The shortage of trained, capable teachers is part of the vicious circle in which education is caught. As now organized schools cannot expand because the country lacks enough teachers to properly staff all the necessary grade levels. The country may not be turning out enough educated people and schools can't afford to hire even those available. Furthermore, recruitment of unqualified teachers in order to enroll more students only aggravates the basic problem.

Management: Education everywhere has become a major undertaking, making ever larger demands on national resources. Yet, in general, there has been no corresponding spurt in the expertise of educational management. Methods of financial control, information systems, efficient utilization -- all remain on a primitive level. For example, equipment and buildings used in education cost the same irrespective of how often they are actually used.

In education more productive use of school space or of specialized equipment gains administrators no premium, nor is unproductive use penalized. While education, which is not literally an "industry," cannot adopt business-management techniques wholesale, it is also true that education is inefficient and could learn something from business management. By and large schools continue to follow traditional procedures in the allocation of manpower and money.

Curricula and teaching methods: All too often education is judged -- or judges itself -- by standards that bear small relation to the actual products of the system, or to the requirements of today's world. Teaching methods and curricula tend to remain the same year in and year out. While society is undergoing fundamental economic and political changes, schools and colleges change slowly and for the most part superficially.

Most systems aim to graduate "educated" people, which often means educated to some traditional, and often imported, ideal of gentleman and scholar. The sort of education that was developed when only an elite attended school is stretched -- but not replanned -- to meet the new needs of universal education. Instructional methods that may have worked in elitist systems for the relatively few are no longer efficient or effective for mass education. As a result student dissatisfaction feeds the educational crisis, and the products of the system enter society, either untrained or with knowledge and skills that are not necessarily relevant to society's needs or their own.

* * *

Educational change

There are many ways decision-makers can try to meet the educational crisis. Teachers can be better trained, school hours lengthened, space and equipment utilized more efficiently, parents and teacher aides brought in, schools reorganized so that facilities, expertise, and teaching materials can be shared. By and large these solutions reflect the conventional wisdom of educational establishments everywhere. Where feasible, they can without doubt jack up lagging school systems and produce better results (i.e., greater learning on the part of the students) more efficiently.

But there is growing recognition, among responsible officials and observers in and out of developing countries, that measures like these are not likely to bring about basic improvement except at a dangerously slow rate. If resources, inadequate to start with, are stretched to patch up and expand the existing educational institutions along traditional lines, it is hard to see how current educational pressures can be resolved or brought under control for a long time -- if ever. Thus the situation might still be as grave (or graver) a generation from now as it is today. In any event, the expansion of education along traditional lines -- certified teachers working in separate classrooms with 30-50 students -- may well be both unfeasible and undesirable.

In short, the educational plight of many countries is one which many of their leaders recognize cannot be solved by conventional methods. Some have therefore turned their attention to newer, more radical solutions: one is the application of communications technology to education.

This handbook tries to show that technological innovation -- when wisely planned and operated -- can have a far-reaching beneficial impact on education in or out of school. Such innovation holds the promise as well of reaching more learners at less cost per individual than a traditionally structured system.

Experience, though still limited and inconclusive, strongly indicates that the media -- television in particular -- can transform education just as technology has transformed other sectors of society. (Obviously technology can be damaging as well as beneficial to education without humane and wise controls.) Requiring as it does so much time, money, talent, and energy, educational technology -- if it is to be effective -- almost mandates an assessment of the basic assumptions underlying a given system. This process of reform may not be formal or deliberate, but it happens. And it is often long, difficult, and even painful.

What is educational technology?

Educational technology can be defined in two ways. In its more familiar sense, it means the media born of the communications revolution which can be used for instructional purposes, alone or in combination, alongside the teacher, textbook, and blackboard. These media include radio, television, films, overhead projectors, programmed instruction, computers, and other items of "hardware" and "software" (to use the convenient jargon that distinguishes machines from programs).

The second and more recent definition of educational technology goes beyond any particular machine, medium, or device. Too much emphasis placed on equipment as such has led to impoverished applications. In this new sense, educational technology means a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman media to bring about more effective instruction. Though there have been only limited attempts to design instruction using such a systematic, comprehensive approach, there is reason to believe that this approach holds the key to the contribution technology can make to the advancement and improvement of education.

Whether the medium be film, programmed instruction, or radio, the instructional content is designed for use in more locations with more learners than any teacher could cover in a lifetime. In that sense, educational technology adapts the communications revolution to education, in and out of school. But in another sense, it belongs to a different development: recent findings in the behavioral sciences. For educational technology, properly applied, can make education more sensitive to the variety of ways in which people learn. It can help adapt instruction to the individual and encourage the design of learning materials which are suited to different learning styles, levels, and purposes.

The basic argument underlying this book uses educational technology in its second and more revolutionary meaning, which presumes a systematic approach to the design of conditions of learning.

There are disappointingly few examples anywhere of a truly comprehensive use of educational technology. Things have not changed substantially since 1967, when The New Media: Memo to Educational Planners by Wilbur Schramm et al., the most thorough study ever made of the uses of the new media in the developing countries, concluded: "In only a relatively few places have the media been used as full partners in education, been woven into the system, and used seriously and fully to attack urgent problems.... The new media are still a little-used tool of education, and their full potential has never been tested."*

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* Wilbur Schramm, Philip H. Coombs, Friedrich Kahnert, Jack Lyle, The New Media: Memo to Educational Planners, UNESCO: International Institute for Educational Planning, 1967, p. 16.

The past few years have seen some progress, to be sure. A few countries have undertaken long-range programs in which the media have been used as "full partners in education." The film, Classroom Television: Instrument for Educational Change, which was produced concurrently with this handbook, deals with two examples, Niger and El Salvador. Niger, to date, is still a pilot project affecting only a fraction of the nation's schools. But El Salvador is building comprehensive educational reform around television, in a program that will soon involve all junior high schools and will eventually affect the entire range of schooling.

Such examples give promise that the very handicaps that beset the developing countries could make them the best proving ground of technology's value, for two reasons. One is that the demands placed on these educational systems are so great as to resist conventional solutions. The other and more compelling reason is a variation on that aphorism about turning defects into virtues, or making a virtue of necessity. A country's lack of a vast, long-established system of "universal" education could encourage and nourish a climate for change. By contrast, countries like the United States have not yet accepted technology as an integral instrument of educational improvement.

Reflecting preliminary lessons that have been gleaned from existing projects as well as from recent investigations, this handbook takes up these principal questions:

1. What are the essential steps in planning an educational technology "system" and putting it into effect?

2. What are the components of "educational technology"? Where is it being used in an integral way to improve education?

3. Looking toward the future, what are technology's promises and limitations which national planning should take account of now?

This handbook also includes:

- Sources for further information on actual projects; on international and regional organizations equipped to give advice, materials, and aid (sometimes financial); and on selected sources of equipment and programs (Appendix A);
- A selected and classified bibliography (Appendix B).

II

II. Planning and Operating an Educational Technology System

Educational technology will bring optimal benefits if it is planned as part of a wide reordering of education -- change in teaching methods, in curriculum, in the teacher's role, in standards of achievement. Educational technology, in its systematic sense, requires the decision-maker to question conventional assumptions, for instance:

- Why is a live teacher used to teach a given lesson; a particular subject area?
- Why is a teacher lecturing to only 30 students?
- Would results be different (better, worse) if the number of students were increased?
- Why are all students expected to go through the curriculum at the same rate?
- Why is there no practical provision for the teacher to work with small groups of students; to combine his talents with complementary talents of his colleagues; to encourage children to work on their own or to learn from each other?
- What learning can be effectively gained from media such as books, teaching machines, or television, thus freeing the teacher to assume other more useful classroom functions?
- Why are school days divided up into 45- or 50-minute periods?
- Why are new classrooms being built all the same size?

- Why must "schools" be set off from the community in specialized buildings that see little other use?

Each country must, of course, answer such questions for itself, aided by whatever enlightenment is provided by experience elsewhere and sound research findings. No "model" system can have universal application. Requirements and resources differ from country to country; each will devise its own particular system, taking advantage of changes and advances in the evolving art of educational technology.

II-A. Objectives and Priorities

The first step in planning an educational media system is to formulate educational objectives and establish priorities among them. A hard-headed analysis of present objectives can produce surprising results. It may be that accepted, but largely unexamined, objectives are mutually exclusive or impossible of attainment or seriously out of joint with the actual needs of society and its members.

A crude checklist of accepted objectives, common to most countries, might go like this:

- Schooling opportunities for all children, at least through the elementary grades.
- Opportunity for university and professional education for all who qualify.
- Technical training (in and out of school) geared to social and economic needs.
- Universal literacy.
- Effective means to bring the general population information and advice that will enhance public health, governance, and the overall quality of life.

Any country or community embarking on a serious campaign to upgrade its educational output is well advised to devote all the time needed to defining its objectives clearly, in terms that will command general understanding and support. "Schooling opportunities for all children," for example, is a splendid objective, but its implications and precise meaning must be hammered out in detail, and broken down into a whole series of precise sub-objectives.

Specification of all objectives at many different levels of precision is vital, from the objectives of the system as a whole down to detailed objectives governing individual courses and course components. Specification requires a kind of down-to-earth analysis that is hard to do; few educators and educational leaders anywhere in the world have yet applied it effectively and consistently. But there is convincing evidence from other areas like business and industry that this kind of systematic statement of objectives pays off in the end.

To be most useful educational objectives must be written down and then revised continually. They should emphasize the student's ability to think logically and critically, and to analyze daily problems effectively. These are tools which will be valuable to the student throughout his life; therefore, the design of an educational system should give them heavy emphasis.

A clear statement of objectives is a basic prerequisite to the design of an effective segment of instruction. The objectives can then be used to guide daily classroom activities. The clearer each objective, the easier it will be to measure a student's success in attaining it.

A well-formed objective usually specifies:

1. Who will perform the task: for example, the objective should state that the student (or learner), not the teacher, must do the work.

2. What specific behavior is required of the student and how it is to be observed. "The student must orally describe the political organization of his province" is an objective which can be observed, and hence, measured. The statement that "the student must know the political organization of his province" does not, on the other hand, specify a measurable result. Care must be taken to use verbs which are not ambiguous. "To recall" and "to solve," for example, are verbs which provide observable intellectual processes. The verb "to know" does not.

3. What the conditions are under which the behavior is to be performed. The objective must include any special conditions. If such conditions are not specified, the usual conditions -- as understood both by the learner and the evaluator or teacher -- are assumed to apply. Thus "the student should list the rivers in his region," requires that the student produce the list unaided. If "using a map" were added, however, the conditions would be altered.

4. What is the minimum acceptable standard performance by the learner. In many cases it is advisable to specify the minimum, qualitative or quantitative level of performance expected, in order to help the evaluator determine how well the learner is doing. Thus, "the learner must score at least 85 percent in the following geography quiz" makes expectations explicit; so does "the learner must swim the length of the pool in two minutes or less."

After detailed objectives have been prepared and organized, they can help form the segments of a curriculum that is being revised (see Section II-E). Some segments will undoubtedly resemble the familiar traditional courses; others may be quite different.

Setting up a series of objectives is one thing; arranging priorities among them is quite another. As a representative of one hard-pressed Latin American country commented: "What do you mean 'top priority?' Everything that our educational system lacks is top priority -- we've no choice but to meet all these needs." And he added: "On top of that we've got to juggle all these demands for more and better education at all levels with equally pressing and extensive problems having to do with public health, housing, community development -- the list is endless."

Furthermore, some of the major educational problems that a developing country faces are not to be solved within the walls of formal institutions. They are confined to no particular age group, no particular location. For example:

- Extraordinarily low literacy rates in the population as a whole;
- A steady exodus from farm to city due to the fact that educational, as well as job, opportunities are mainly to be found in urban areas;
- Acute industrial shortages at many different levels of skill;
- Requirements for professional updating;
- In rural areas, public health, agriculture, and community development all demanding efficient ways of transmitting up-to-date information from expert to user, from national to local levels, and vice versa.

Concentrating efforts within the formal school system means that several generations of people, of or past school age, will be condemned to an unproductive, uninformed, and dependent existence. Education outside school has to date received little support for many reasons. One is that meeting the needs of a widely scattered population in a country with poor transportation defies conventional educational methods. But modern communications technology increases the feasibility of nonformal education.

The harder the choice among competing demands, the clearer it becomes that a country cannot do everything at once. However appealing it may be to attack on all fronts simultaneously, the diffusion of effort may do more harm than good by spreading improvements thin and wasting scarce resources in the bargain. Projects involving broad-scale changes must, paradoxically, begin small, as the first step in a carefully designed program that can expand and improve on initial efforts. It is essential to dedicate time and effort toward making the early, experimental stages successful, and then to move on forcefully to the next stage.

II-B. Data Collection

Another phase in designing a new educational system is to make a detailed inventory of the system (or, perhaps more accurately, "nonsystem") that now exists. Many different types of data are needed. The quality and objectivity of the data collected and the form in which it is presented to decision-makers will deeply influence the systematic planning that follows. Good data make possible continuing reformulation of sensible objectives and clear deliberation on the best means of achieving them. The following list indicates some of the more obvious items that need to be identified at the first stage:

- Enrollment figures for all levels of education -- primary, secondary, higher, and adult.

- Numbers graduating from elementary, secondary, and higher education.

- Percentages of dropouts and repeaters at all levels.

- Percentage of school- and college-age population not receiving any formal education.

- Number of qualified teachers at all levels.

- Turnover of teachers -- both within institutions, and also from education to jobs outside.

- Teacher education facilities. Present requirements for teacher certification or qualification. Enrollment, dropout, and graduation figures. Percentage of graduating teachers not taking up teaching posts.

- Inventory of school buildings, instructional materials, equipment. Estimates of utilization rate.

- Education budget and budgetary constraints. Cost of education per enrolled student at all levels. Cost per graduating student.
- Adult (or "continuing") education facilities, and estimated participation.
- Adult illiteracy figures.
- Industrial training statistics.

Such data will provide at least a quantitative picture of the educational system. The statistics, if they are to be useful in planning, must include enough information on the past and the future (projections for five to ten years ahead) to reflect population trends, country to city mobility, and changing economic requirements.

Compiling such an inventory is difficult. Few school systems anywhere, however affluent and "enlightened" they may be, can manage to achieve really candid, thorough-going studies of themselves. But difficult -- and in all likelihood discouraging -- as the task may be, it is a prerequisite to agreeing on the most serious educational problems and what to do about them. Comprehensive data collection tends to highlight all kinds of things that previously had been overlooked.

Inventories of existing systems point up one hard lesson that society is finally beginning to understand: that there is only a slim correlation between what goes into a given school system (i.e., quality and quantity of buildings, teachers, equipment, etc.) and what comes out (i.e., the real achievement of the students and education's contribution to society).

Measuring what comes out of education -- the system's output -- is much more difficult than measuring the system's inputs -- buildings, textbooks, etc. Yet any basic inventory must include an attempt at identifying the results of the educational system, and go beyond the statistics cited above to include:

- Unemployment rate of graduates.
- Relation of education's output to national needs and goals.
- Shortages of skilled manpower in the economy.
- Performance in national examinations. Proficiency levels in reading, etc. Performance on tests for entry into armed services.

These "results" of education are crude and open to much argument. The unemployment rate of graduates, for example, reflects as much on a nation's economic policies and social values as it does on the educational system. Valid measures of educational output are lacking in all countries of the world. Yet some analysis of education's results -- however blunt an instrument it may be at the present time -- is essential. Only on the basis of such analysis can rational discussion follow as to where education is producing results that meet society's needs and the well-being of individuals.

II-C. Resources

Resources -- their allocation and use -- are central to educational system planning. The problem is simple to state: How can a country achieve the best educational results given its resources? The answer is complex. As already noted, the relation between what goes into education by way of resources and what comes out by way of results is little understood. This is true both in the large picture (ratio between a nation's educational expenditures and economic growth) and also in the small (ratio between, for example, the costs of a particular reading program and children's actual ability to read).

Any country planning a new educational system based on the new media must make sure of adequate resources. Yet many applications of educational technology have failed to do so, with wasteful results. For convenience, resources can perhaps best be studied under four headings which are not mutually exclusive:

1. money
2. manpower
3. equipment/buildings
4. program materials

All are constraints on the selection of educational objectives and of means to achieve them. All are essential in the right amounts of the right quality for the right period of time ahead if a new system is to succeed.

1. Money

Money is the basic requirement, strongly affecting decisions about manpower, equipment/buildings, and program materials.

The evidence suggests that a system using technology will permit higher teacher-student ratios than would a stretching of the present system. Thus, while a new system based on technology would be unlikely to cut total costs initially, costs per student would be expected to decrease as soon as the system reaches significant magnitude. But this expectation of eventual cost effectiveness does not alter the immediate facts of economic life. To date many developing countries have found they needed financial help from external sources, at least for start-up costs. And it is vital to go beyond the initial capital investment and operating expenditures to estimate what it will take to produce programs and related materials, buy replacements of equipment, keep up maintenance, etc., for years ahead. If a project starts in a limited number of schools, planners must realistically gauge the costs of future expansion in the light of long-term economic prospects.

Some developing countries have enough resources to initiate reforms on their own. Some (like El Salvador) add substantial funds of their own to grants or loans provided from outside the country. And in theory, at least, developing countries have such options as reallocating expenditures within educational budgets.

Most developing countries will not be able to increase their educational expenditures by much in the years to come because, as noted earlier, other public services and essential economic development compete for scarce resources. Some countries may actually have to cut their expenditures for education, or stabilize them at present levels (the equivalent, with rising population, of a cut in real terms). All countries are caught in the spiral of rising costs.

About 10 percent of education budgets in the developing world comes from external sources* -- from the United Nations, from private organizations such as foundations and religious groups, and from industrialized countries as bilateral and multilateral aid. One of the features of external financial assistance is that it usually takes the form, not of money, but of scholarships, technical specialists, or capital equipment.

A country's educational authorities should carefully scrutinize methods of financial allocation and control. This aspect of managerial reform is virtually prerequisite to installing a new educational system. Present methods of financial control are primarily fiduciary in nature: their primary purpose, i.e., is to assure the public of proper accounting for each dollar received and proper authorization for each dollar spent. Fiduciary accounting systems serve an important function in society but the data they generate need reprocessing, supplementing, and further analysis, sometimes at great cost and effort, to serve useful management functions.

Traditional budgets divide the money spent by line items -- heating, TV sets, teachers' salaries -- and do not show the purpose of the expenditures -- teaching reading to primary school children, reducing adult illiteracy. A new type of budgeting is required if cost comparisons are to be possible between alternative objectives and between alternative ways of meeting given objectives -- the heart of system planning.

Some success has been achieved in U. S. government and industry with program budgeting, which relates expenditure directly to objectives, and which groups manpower, equipment, and buildings into functional programs. This provides the decision-maker with information about the various implications of different lines of action. Much more analytical work is required before program budgeting can be applied to education.

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* Source: Philip H. Coombs, The World Educational Crisis: A Systems Analysis. Oxford University Press, 1968, p. 151.

But clearly this kind of approach -- which relates financial inputs to human and social outputs, means to ends -- should be reflected in educational planning.

2. Manpower

To mount comprehensive reform of a country's educational system requires a variety of talented and enthusiastic people with many different, interlocking kinds of skills. The human element can break the system or make it. There are always people, both native and foreign, who, for various reasons, oppose any changes in the present educational system. The political influence that such persons exert should never be underestimated. Unless there is substantial support at all levels from the ministry in the capital city to the remote rural classroom, objectives are likely to be distorted, and plans for change shelved.

There are three general types of manpower required by a new system making use of educational technology: managers, producers, and teachers.

- Managers: Administrative staff at ministry level, in national and regional production centers, in schools and colleges. Essentially the decision-makers, responsible for system planning, allocation of resources, quality control.
- Producers: Staff responsible for curriculum development and the production of

teaching materials, teachers' guides, etc., in various media (print, television, film, etc.). TV, radio, etc., teachers and actors. Engineering staff responsible for distribution systems, and maintenance technicians. Also liaison/utilization staff acting as feedback link between classrooms and production centers.

- Teachers: The teachers, monitors, and teacher aides working in the classroom with students face to face.

Training schemes, both pre-service and in-service, must be given top priority in any manpower decisions. In a system making use of broadcasting, the broadcasting channels might be used to speed up training programs and distribute training to distant locations.

Today's educational administrator in all countries is seldom equipped to deal with the varied responsibilities of a new educational system, requiring the coordination of many disparate components, and the planned development of equipment, buildings, and instructional materials within strict financial and time constraints. To call for a "managerial revolution" in education is not to overstate the problem. Today's classroom teacher is usually not trained to utilize the new media to their greatest effect.

Many of the skills required in the three areas of management, production, and teaching may be unavailable or insufficient inside a developing country. The integration of foreign advisors, experts from outside, often causes difficulties. Outsiders sometimes do not know the native language(s) and are not sensitive enough to cultural and national differences. Countries that have had their curricula dominated for too long by ex-imperial powers may be wary of outside assistance. The use of outsiders underlines once again the importance of training schemes. If from the start a country knows that local people are being trained to replace the foreigners as they return home at the end of contracts, there will be much less chance of conflict.

Too often systematic planning (or "the systems approach") is made to sound thoroughly mechanistic, perhaps because it tends to be associated with computers. A system can be beautifully planned yet still fail because it fails to take proper account of the needs and fears of the human beings affected.

3. Equipment/Buildings

In planning equipment and buildings, a complex of different factors come together, which if disregarded can lead to enormous and expensive disruption.

- Maintenance and repair requirements
- Utilization rate of equipment/buildings
- Planning for expansion
- Technical compatibility
- Flexibility

The problem of maintenance is serious. Well-functioning equipment is essential if the classroom teacher or monitor is to be able to devote his energies fully to the students. Maintenance is particularly difficult in countries with poorly developed road and communication systems. Good maintenance and repair depend on trained technicians in adequate numbers.

Different climatic conditions mean that maintenance problems in one country may be larger than in another. Television receivers, for example, are notoriously unreliable in tropical countries with high humidity. American Samoa found that it was economically advantageous to leave sets switched on day and night.

In densely populated areas, central repair units are feasible; television receivers can be quickly replaced so that classroom work is not interrupted. But away from the main towns and cities, replacement problems increase, even though the technology has often been chosen just because of its power of reaching widely separated people. It is also in the rural areas that electric power may be nonexistent or unstable so that, for example, battery-fed television receivers (as in Niger) add to maintenance costs. Problems with maintenance will occur in direct proportion to the amount of care and skill with which equipment is handled. And this fact reinforces the need for training, especially of classroom teachers and monitors.

The cost of equipment and buildings is so high that they must be used to capacity. Utilization rate becomes, therefore, an important part of resource planning. As noted earlier, educational institutions seldom if ever cost their equipment and space in terms of rate and use. The result is wasted money, and equipment either not used at all or not used to capacity.

Unless authorities heed usage rates, there is no real incentive for teachers or administrators to make full and productive use of scarce resources. Television equipment lies about in crates; school buildings, representing a capital investment of millions of dollars, are open only a fraction of the year. It has been estimated that the computers already installed in developing countries by government and industry are not used to more than 10 percent of capacity. Broadcasting systems already in operation for the purposes of entertainment and news are often not on the air during the daytime. Such unused capacity could be devoted to education, with the prospect of significant savings.

El Salvador has developed the idea of three teachers and three classrooms which could handle three primary grades in the morning and another three primary grades in the afternoon. As a result, one half of the cost of construction and equipment could be saved, the teacher's productivity doubled, and resources more efficiently used. Keeping track of utilization rates requires more sophisticated costing techniques, hence greater managerial expertise. Also, high utilization rates have implications for the choice of building materials and the durability of equipment.

The possibility of future expansion must influence initial choice of equipment and buildings. "Planning for success" may save money at a later stage. Coaxial cable connections for closed-circuit television are far more expensive to install in a building once it is built. It may, therefore, be cost-effective to provide for cable in new buildings even if it is not used for four or five years ahead. While for a limited system it may be sensible to purchase cheap videotape recorders, in the longer term, with the system expanded, a more expensive version may be a more sensible choice from the start in terms of reliability, durability, and efficiency.

One of the recurrent difficulties faced by educational managers in the purchase of equipment is technical compatibility. For example, a videotape recorded on one machine may be impossible to play back on another machine. With the new 8 mm films that are gaining popularity in education, not all films are usable with all makes of projectors. Problems like these arise if equipment is purchased from different manufacturers or purchased over a period of years, with earlier "editions" not compatible with later ones.

A final important factor is flexibility, particularly of buildings. A good system of education will not be static. As a result of feedback and evaluation, changes will and should be made. Many changes by their very nature cannot be foreseen. To take an example from school architecture, classrooms should ideally be constructed so that walls can be removed, changed around, or added, in order to accommodate different sizes. It becomes increasingly clear that there is no optimum size of class for every subject at every level. Instead there should be opportunities for large- and small-group instruction, as well as individual instruction and independent study. This is the essence of team teaching, and good television projects are in one sense an extension of the basic team-teaching idea.

Furthermore, equipment with multiple uses is obviously preferable to equipment serving very limited functions. One of the major weaknesses of many teaching machines has been their limitation to one particular kind of software. Compare, on the other hand, the flexibility of the blackboard or tape recorder.

A country undertaking a major application of educational television, for example, must require at minimum that:

- Transmission facilities are reliable;
- Studio equipment is adequate for the quantity and quality of programs planned for production;

- Enough sets are available to reach the audience the programs are meant to serve;
- There is some reliable arrangement for maintaining sets and providing them with adequate and stable power supplies;
- Basic facilities are available to transport equipment and program materials to and from the schools.

A country should weigh these various requirements in deciding when and whether to introduce educational technology.

4. Program Materials

A new educational system, with new curriculum and methods, generates the need for new teaching materials. Most of the old textbooks will be inappropriate, especially so in countries wishing to bring the curriculum closer to the reality of their own particular culture, and away from the previous domination of a foreign culture. Yet the production of new teaching materials often takes more money and time than is usually estimated.

A television program making maximum use of film and graphics could cost as much as the equivalent of several thousand U. S. dollars. A simpler use of the medium -- transmitting a classroom lecture, say -- could cost just a few hundred. Radio costs about one tenth what television does per lesson. Films making use of high-speed photography and time-lapse can cost a thousand dollars a minute. A programmed text's cost will depend to a large extent on how scientifically it has been validated with a sample of the student population and how many resulting modifications have been permitted. Educational programs, like the transmission equipment they are fed through, cost less the more students they reach. This critical economic truth means that much of the money available for reaching large populations can go into the development of truly high-quality programs.

A country should consider carefully the feasibility and effectiveness of locally produced materials as opposed to those obtained from external sources. Obviously, local culture and identity will best be reinforced by materials produced locally. El Salvador, for example, using television as a catalyst for educational reform, found it essential to produce its own materials, thus helping to ensure educational relevance and effectiveness as well as national viability for the entire effort. At the same time, there is no need to rely exclusively on local production.

Various organizations can provide information on external sources for materials. (For a list of selected sources, see Appendix A.) Commercial firms, private foundations, bilateral and international assistance agencies, and national broadcasting corporations offer materials ranging from complete taped or filmed courses to course outlines and production guides designed to fit in with local series. Language and cultural differences, copyright, and problems of compatibility combine to make external producers a tricky resource to exploit, however.

In addition to usable teaching materials, with or without modifications, from sources outside the country, a country should share its internal resources whenever possible. Many of the troubles with instructional television in the USA, for example, have stemmed from duplication of production effort and wasted resources. In any large country, the organization of regional and/or national centers would seem to be a prerequisite for the economical production of good instructional materials.

One final and most important requirement in the production of program materials: integration. A system is only as good as the integration of the components. Television and radio lessons will succeed to the extent that they are supported by teachers' guides, workbooks, textbooks, and suggestions for laboratory work. Investment in the quality of these components is as important as investment in the television programming itself. This mix of resources should be tailored daily to the needs of the individual student. Integration requires time and resources. The relationships between various types of materials, and between materials and the teacher in the classroom, need to be analyzed, in order to move toward a system which uses all its learning resources selectively -- each medium including the teacher fulfilling the appropriate functions. (For specific details, see case studies beginning page 57.)

* * *

Money, manpower, equipment/buildings, program materials -- these are in a sense the building blocks. Two elements are required to form them into a successful working system -- concentration of effort and of resources.

Concentration of effort

Systematic planning takes a greater intensity and range of effort than is usually expected. There are many agencies to be consulted, many components to be brought into new relationships with each other. New organizational structures are required and new patterns of working. Gaining the interest and cooperation of classroom teachers should get all the time and attention required. In the development of programmed instruction materials (ideally, all instructional materials), it is essential to set aside time for the vital pre-testing stage. Projects that rush into action too fast may find themselves in trouble.

Concentration of resources

Economies of scale are vital in allocating and using resources within a new educational system. The newer media make more sense the larger the student population they serve. A television program, for example, costs the same to produce whether it is watched by one student or a million.

Television is a mass medium; if it is to achieve maximum impact at minimum cost, programs should reach large numbers. Under-use is a common disease of educational media projects.

A language laboratory becomes more and more cost-effective the more hours in the day that it is used. A communications satellite can never approach cost-effectiveness unless it is used extensively by a large country, or a consortium of smaller countries. But such economies of scale are difficult without centralization or at least working cooperation among independent institutions. Schools and colleges are often not willing to share resources with one another. Teaching staffs are resistant to using instructional materials produced by another institution. Textbooks long ago overcame these prejudices, but nonprint materials still meet strong resistance.

II-D. Alternative Means and Ends

Assuming that priorities have been set, the present educational system has been inventoried, and resources determined, the next question follows: What alternative ways would obtain the best results? Many factors influence the answer, such as resources, existing communications, technical feasibility, and geography.

The commonest pitfall is to start out with an enthusiasm for (say) television and then decide what it might be good for, rather than starting with what needs to be done and then deciding what technology, if any, might help in accomplishing the desired objective. The relationship between ends and means is not a simple one, however. The means can and do influence the ends, both for good and ill. The new communications media make it possible to seek objectives which might not have been otherwise reachable or, even more likely, envisaged.

For example, many leading educators believe that the new technology makes individualized learning, so long an avowed ideal, a feasible aim for both developing and developed countries in the 1970s and 1980s. A wider range of media -- television, tapes, filmstrips, programmed texts, etc. -- means that the individual student can interact as never before with a wider range of subject matter at his own rate and in his own way. Mass instruction based exclusively on teacher and textbook made this degree of individualizing impossible. Group instruction has necessarily been the dominant strategy. The live teacher, however excellent, is only accessible to students gathered at one place at one point in time. Recorded instruction stored and distributed via books, television, radio, and computer program is accessible to all students irrespective of time and place.

The risk incurred in deciding to use a particular medium without real analysis of the needs to be met is greatest when the technology is exciting (e.g. TV and satellites) and the stakes are high. The results of such ill-founded decisions are often wasteful -- expensive television equipment and film production systems left to gather dust while nearby classrooms cry out for modern textbooks or even paper and pencils.

A broad, unbiased approach is therefore prerequisite to making the wisest choice of an instructional system best suited to a country's resources, objectives, and priorities. Each alternative must be weighed as to how it may improve the quality and effectiveness of education and as to what it will cost in money, time, and effort. For each possibility, there should therefore be a detailed analysis of potential effectiveness, taking into account such variables as:

- ability to reach the target population;
- number of different programs needed simultaneously (with radio and/or television: number of channels);
- number of points of origin (transmitting stations; program development agencies; other distribution centers) and points of reception required;
- possible geographical distribution of reception points;
- technical reliability;
- manpower requirements;
- distribution efficiency;
- capacity for feedback and modification.

The analysis should also take account of such political, administrative, and educational variables as:

- ability to provide adequate management of the system;
- degree to which centralization fits into the political structure of the country;
- capacity of the system to overcome any linguistic and cultural differences within the target area;
- degree to which traditional teacher behavior would need to change;
- variations among individual learners that need to be accommodated;
- any useful research findings on the educational effectiveness of the proposed system.

When balancing one alternative with another, there should be reasonable standards by which to judge the relative importance of various advantages and disadvantages. Does the ability to observe scientific demonstrations or dramatic presentations, for instance, offset increased expenditure for television over radio? If it appears not, then consider also whether the apparent cost benefits of radio offset the lower degree of administrative and teacher involvement and commitment which have frequently accompanied use of this medium alone. Perhaps, then, both should be used? Would a ground-based or a satellite-based system be most effective?

At the present time, television is the only medium which has yielded substantial evidence from fully operational programs (see case studies, page 57). But the full range of technological possibilities should be seriously investigated.

Such alternative systems might include:

1. Non-broadcast systems

   Audio/video tapes, cassettes, and printed materials circulated to schools, community groups, individuals by mail or post.

2. Ground-based systems, local or regional

   a. Television transmission and reception via terrestrial network.

   b. Radio transmission and reception via terrestrial network; radiovision

   c. Telecommunications via terrestrial network.

3. Satellite-based systems

   a. Television transmission and reception via satellite.

   b. Radio transmission and reception via satellite.

   c. Telecommunications transmission and reception via satellite.

4. Satellite-combined systems

   a. Television, combined satellite and terrestrial transmissions, and reception from terrestrial relay and direct from satellite.

   b. Radio, combined satellite and terrestrial transmissions, and reception from terrestrial relay and direct from satellite.

c. Telecommunications from combined satellite and microwave/cable systems.

While it is true that there is little definitive knowledge about many of these options, particularly those involving satellites, interest and knowledge are growing rapidly. Pilot projects, soon to begin, will yield valuable information to educational leaders around the world who are seeking a comprehensive understanding of the options open to them. In the meantime, every effort should be made to seek the most up-to-date information and most expert guidance. For further discussion see Chapters III and IV.

II-E. Curriculum

A thorough examination of alternatives inevitably leads to consideration of the total curriculum. At the point where student meets subject matter, the determination of objectives and curriculum development converge and should not be considered apart. Similarly, any rigid separation between curriculum development and materials production conflicts with the reality of the learning process.

Recent years have produced new ideas about curriculum as well as new ideas on modes of instruction. Unfortunately, these two aspects of educational improvement, so intrinsically related, are treated as separate professional specialties. Teachers may welcome new methods but not new curriculum. With the introduction of the "new math," for instance, the classroom teacher may accept the "form" of the new curriculum -- the cuisenaire rods and three-dimensional materials -- but not the substance. Another example: language laboratories have often been used not to develop the oral skills for which they were designed, but to teach the traditional grammar-based curriculum. At teacher-training institutions the professor may be up-to-date in teaching method but out-of-date in his grasp of mathematics. With the university professor -- the scholarly mathematician -- the reverse is often true.

There is nothing intrinsically wrong with using films or radio or tapes to enrich and deepen the traditional curriculum, and add variety to classroom procedures. In a school which relies heavily on rote memorization -- transmission and retention of facts -- there are obvious uses for some kinds of teaching machines. Technology has its uses as another means of transmitting content. This approach, to oversimplify, takes the standard curriculum and translates it into film or tape: in place of the live teacher lecturing to a class, the televised teacher lectures. Some of the best known and ostensibly successful television projects in the United States illustrate this use of the medium: the extensive programming in the public schools of Washington County, Maryland; the Chicago TV College; closed-circuit television at Pennsylvania State University. Television here serves useful purposes: in Maryland, bringing a full range of subjects to out-of-the-way schools and supplying art and music instruction, e.g., otherwise unavailable; in Chicago, making it possible for students, most of whom are unable to attend conventional classes, to acquire a junior-college education at home; at Pennsylvania State University, bringing university lectures to larger numbers of students in the overcrowded first- and second-year courses.

However, the question remains whether these projects would be more effective with less traditional conceptions about the teacher's role, instructional methods, and -- most important -- the concept of what is to be taught. For, while the introduction of educational technology does not literally enforce revamping the curriculum, many educators, media specialists, and experienced observers of education are nevertheless convinced that technology will realize its full potential for education only when educators incorporate the new media into a comprehensive system that embraces curriculum reform. A curriculum that lays more emphasis on subjects relevant to the students' world, on problem solving and concept formation, on structure, enquiry, and learning to learn, than on factual recognition and recall can better exploit new methods and techniques.

The very cost -- in money, effort, time, talent -- of producing, say, a series of television lessons encourages planners to examine the curriculum. Is it worthwhile just transferring the standard lecture or demonstration onto videotape? Is the standard course of study, however hallowed by local tradition or illustrious foreign precedent, truly appropriate to present-day requirements, individual or social?

El Salvador undertook an extensive television project in conjunction with a thorough-going revision of curriculum and other closely related changes in teacher training, materials, and methods. As it happens, Salvador put prime emphasis on updating the subject matter taught (the new math, for example). Niger's tiny pilot project, however, put greater emphasis on the creative use of television to reform the curriculum.

Remodeling a curriculum is complex and time-consuming. Specialists are required -- people versed in subject matter, people attuned to our still unsure grasp of the learning process, and others knowledgeable about cultural variations in this process. Curriculum development is not a self-contained activity. It is intimately bound up with all the other components of systematic educational planning: specification of objectives, choice of media, production of new materials, teacher training, and so on.

II-F. Organization and Utilization

1. Organization

Worldwide experience with the use of technology for education underscores the need for strong organization from the top down. Witness all the promising attempts to use educational technology that have foundered for lack of proper, well-integrated direction.

Clear-cut lines of authority and effective coordination of the administrative agencies concerned are essential. This rule holds whether the controlling agency is a more or less autonomous school district or a federal district or province, or whether a nation's educational system is essentially directed by the central government. A large scale application of instructional technology, for example, will involve agencies and departments outside education that must cooperate and endorse joint plans. Even if a program begins as a small experiment, it should not operate apart from the central authority responsible for its ultimate expansion or termination.

In some countries the broadcasting facilities are run by the ministry of culture or communication, which will want to retain control and not share it with educationists from another ministry. In some cases it is important to ensure the participation of non-governmental groups, such as industries concerned with vocational or technical training.

There are other problems of organization, equally critical but quite imponderable. One is the effect of shifts in political power. Another, closely related and even less predictable, is the influence of personality on the ultimate fate of a given project. This factor cuts both ways, of course. Personality clashes among key ministers can imperil the project. Conversely -- and examples abound in Latin America, Africa, the U. S. A. -- a strong enthusiastic personality in the right place at the right time can make a project go, even in the face of meager resources and other formidable obstacles.

The production of program materials has obvious implications for organizational structure. Teamwork of a high order is required among people not normally used to it. Subject-matter specialists, media specialists, classroom teachers -- all have to work together on equal terms within strict deadlines. Tension can result, and without well-planned organization and good managers, the production of materials can quickly run into trouble. Teachers, for example, are far more aware of nuances and pace of classroom learning than are television producers. On the other hand, the producer has a keener sense of the medium's possibilities and limitations for education than the television teacher with little broadcasting experience. The nature of the partnership between classroom specialists and media producer will be to a large extent determined by organizational decisions. Should the television production staff, for example, operate under the direction of education authorities?

The role of foreign advisors -- media specialists and curriculum planners, for example -- raises further problems of organization. Local people may resent their expertise especially when it is applied to the sensitive area of what and how children are to learn. A good working relationship is essential between the foreign advisors and the indigenous staff who know local conditions and needs. As noted in the preceding chapter, this is facilitated by the clear understanding that trained nationals will eventually take over the show.

The obvious implications of educational reform for the classroom teacher deserve careful attention. Because they mainly concern actual day-to-day instruction they are best discussed under the general rubric of "utilization."

2. Utilization

a. Teachers

The role of the classroom teacher may, and should, change radically in any comprehensive educational reform using new media. No longer solely responsible for instruction, the teacher must take on many new responsibilities.

After a television lesson is over, for example, a teacher or monitor must be available to answer specific questions, to initiate and supervise individual activities. Most experts agree that even with direct TV teaching, students will learn better if the teacher prepares them for the telecast and follows it up afterwards. In some cases, the teacher may be needed just to keep things going smoothly.

It is not uncommon to find that teachers trained for traditional instruction accept new roles with difficulty. In fact, it is sometimes easier for the untrained but capable person to adapt to the new system and make it work. Niger, for example, uses monitors rather than teachers, with generally good results. The monitors receive some specialized training, tend to be excited about the way television is being used, and find the new system more relevant than the old to the needs of the young Nigeriennes. Training a new, quasi-professional body of monitors is worth considering. For many countries there is no alternative.

Whether a new system makes use of experienced teachers, novices, or monitors, they do need training (or re-training). Skimping here is poor economy. Examples abound of projects that took teachers' acceptance too much for granted and that wound up with little or no classroom cooperation. If a teacher does not feel involved in the concept or creation of the new program materials, he will probably not use them at all, or use them improperly. The organization of the new system must ensure preparation of the teacher or monitor, and must enlist him, however far away his school may be from the production center, as an indispensable member of the system whose contributions and judgments are respected.

In Salvador, all teachers are brought to a special school and given intensive year-long training, of which television is an integral part. But Salvador's small size makes it relatively easy to bring teachers together in one place. A larger country with more scattered schools and teachers can take advantage of television's capacity for mass and instantaneous distribution to reach the teachers where they are.

b. Classroom arrangements

Full utilization of the new media raises questions about the very nature of school and classroom arrangements. If, for example, students are encouraged to learn independently through programmed texts, why should desks and chairs be arranged in rigid geometric patterns? Again, there is no prescribed size for the ideal television viewing group. Visibility and audibility are obvious physical limitations, but the most critical limitation is perhaps the reach of the classroom teacher. There is no real evidence that television can _teach_ many times the number of students that the traditional system can. It certainly can _reach_ more students. Whether they learn is a different matter. The weight of evidence would seem to indicate that improved learning can come about with television used as an integral part of a well-planned system; and the role of the classroom teacher is probably as critical with television instruction as without.

An essential ingredient to proper classroom utilization of the new broadcast media is the provision of adequate supplementary material. Workbooks, texts, teachers' guides, illustrations, etc. must reach teachers regularly and promptly. These materials must be carefully designed for integration with the daily lesson, thus insuring the quality of each instructional unit. They are an essential link between classroom and central programming and broadcasting authorities. This handbook's chief case studies, El Salvador, Niger, and American Samoa, have devoted considerable time, energy, and money to the provision of such supporting materials.

Careful scheduling of broadcast programs is essential to their smooth and easy use in the classroom. It would be foolish to expect that all classes of a given grade level should always be able to watch the same program at the same time. So a system of repeats is required, and should enter into decisions regarding the number of broadcast channels. The inflexibility of broadcast schedules may be eased in the future by cheaper video- and audiotape recorders which will allow the teacher to use programs at his convenience.

A system using broadcast media should provide flexible school arrangements if teachers are to take advantage of this kind of expert, large-group instruction to find time for working with small groups and individual students. Time (45- or 50-minute periods), space (standard size classrooms), and traditional pupil-teacher ratios ought not to be constants.

II-G. Feedback and Evaluation

"Feedback," a word borrowed from electronics, is used by communication theorists to denote an essential part of communicating: informing the communicator of the effectiveness of his message so that the message can, if necessary, be modified. Feedback is the essence of a continually improving educational system. In a systematic application of educational technology, measurement of results is of fundamental importance. Are the students really learning? How do results achieved by one learning system compare with results achieved by an alternative system?

A classroom teacher who is reasonably alert and experienced can see for himself how a lesson is going. He may not be able to determine what actual learning is taking place, but there are assorted clues at his disposal. He can see whether his students are paying attention, for instance. Through questions he can find out how much they understand. And students having difficulties can ask for help and additional explanation. But a teacher designing or giving lessons for television, radio, tapes, print, slides, does not have this instant feedback.

The enormous initial effort to master the technique and technology of a new medium usually leaves little time for systematic evaluation. And the high costs of media production and training leave little money available for costly feedback systems. Thus very few media projects have provided adequately for feedback and evaluation. However, there are many types which can be used by themselves, or in combination with each other, to suit budgetary and other conditions:

1. Pre-testing materials

Pre-testing is research, and trained researchers should plan and conduct it. Ideally, all new materials should be tested on a representative sample of the intended audience before dissemination to the entire school system. Otherwise, no preparer of new materials, however expert, can be completely confident that his materials will accomplish everything they are expected to.

However, administrators who are trying to keep to a schedule often resist pre-testing and revision, as do program designers who are sensitive to criticism, and other staff members who don't want to see the "artistic" element of programming diluted by scientific analysis. Therefore, a realistic compromise may be to test a few prototype materials made well in advance of a project's actual starting date, and sufficiently representative so that testing results will throw light on the effectiveness of the new materials as a whole.

2. Regular testing on content

Any project using the new media gets some feedback from classroom testing. Usually this comes too late (at the end of the year or term) to correct any problems revealed. However, there is no reason not to test more often (for example, weekly or monthly). Frequent testing, of course, requires the program people to decide clearly and sharply what they expect the students to learn, and what answers will test the outcome.

3. Regular comments from classroom teachers

This is a feedback device commonly used in media projects. Once a week or once a month -- in a few TV projects, after every televised class -- the teacher is asked to fill out a questionnaire. Usually the classroom teacher can answer most questions by quickly checking a statement rather than by writing a comment. These responses, however, are necessarily subjective, and it is sometimes difficult to discern trends clearly enough to be useful.

4. Regular observation of classrooms

If television or radio is used for regular and frequent instruction, it is highly desirable to institute a system of three-way communication among classroom teacher, TV or radio teacher, and the producers of the programs and related materials. "Utilization officers" or supervisors can bring back not only a report on what the classroom teachers think of the television teaching, but also a description of what happened in the classroom.

If the television lessons are videotaped, the television teachers can visit classes themselves to watch what happens when programs are broadcast. This first-hand observation provides a most direct and useful form of feedback.

5. Reports on attitudes

Several of the feedback methods mentioned provide indirect information on whether students and teachers like what they are getting. There is often a discrepancy between teacher and student reaction to, say, a TV program. These reactions can be analyzed by administering attitude scales. The tests must be carefully made so as not to encourage answers skewed to what the tester or the supervisor presumably wants to hear.

* * *

An ideal feedback mechanism within an educational system has two parts. First, there is the gathering of results achieved by the system. Secondly, there is the method of modifying the system in the light of these findings. It is not sufficient to know that a particular science lesson did not "succeed" with the students. How can it be changed so that it will succeed?

This second part -- system modification -- tends to be neglected, for a number of reasons. Television lessons are usually recorded long in advance of transmission, and because they are expensive, there is a reluctance to remake them. With film, the problem is technical. Whereas a video tape can be erased and re-recorded, film once processed cannot be used again for a remake. In El Salvador recently, project directors sought help from the evaluation research team when second-term tests in mathematics revealed a high incidence of failures. Questionnaires and interviews with teachers and students showed that, among other problems, students had simply been unable to keep up with the pace of the course. This finding was fed back to the program staff quickly enough so that, instead of introducing additional new material during the last month of the following term, the television teacher used the time for a review of the difficult parts of the year's work.

There probably is no such thing as a perfect feedback program, because information from the different channels begins to overlap, and at some point the planners and administrators of any project must decide how much overlap they want to pay for, and what combination of methods -- within their capabilities -- will most efficiently give them the requisite amount of feedback. Rather than ideal systems, there are adequate or inadequate systems, efficient or inefficient ones.

II-H. The Systems Approach -- A Summary

An educational system comprises many components -- students, teachers, buildings, textbooks, equipment -- and seeks to attain many objectives. It is possible to ignore the relationships among the various components, and between the components and the objectives, and to let the system run itself in more or less random fashion. This random approach characterizes all too many educational systems, camouflaged by a whole tradition of techniques passed on unquestioned from one generation of teachers to the next. But an educational system is a system, and better results will be achieved if a systems approach is adopted in educational planning and management. Many of the elements have been looked at in previous chapters. Here it may be useful to summarize the main characteristics of the systems approach adapted from the invaluable report, The New Media: Memo to Educational Planners, (see citation, page 6).*

- It begins by defining as clearly and precisely as possible the objectives to be sought.

- It then proceeds to identify the various alternative ways by which these objectives might be attained and to weigh the relative advantages and disadvantages of alternative approaches in order to select the most effective, feasible, and perhaps economical one.

- Having chosen what seems the best alternative, it proceeds to elaborate a plan of action, including a timetable, a definition of actions to be accomplished during each phase, the various resources that will be required along the way, the nature and timing of results anticipated, and practical means for regularly evaluating progress and for making necessary changes in the initial plan. Any such plan must be tested and retested for feasibility during the process of designing it and is likely to go through several revisions before it is ready to be put into action.

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* Schramm et al., Op. Cit., p. 162-164.

The hallmark of this approach is that it views any particular way of solving a problem, of pursuing an objective, or of getting certain work done, as a coherent "system," which involves changes in all the component parts. There are several advantages to using a systematic approach of this kind in educational planning:

- First, the systems approach encourages a clear definition of objectives -- indeed it insists upon this -- not just in broad rhetorical or philosophical terms but in practical operational terms that provide a clear basis for organizing the effort and checking results.

- Second, it perceives education as a communications system, and identifies the many components which constitute its parts -- teachers, students, materials, curriculum, etc. -- and which need to be orchestrated into a unified, efficient, and effective process. How might the components be combined differently, or what new components might be added to get better results? The planner may thus have his eyes opened to new ways of meeting important needs which cannot be met by conventional means.

- Third, it focuses attention sharply on the need to evaluate educational results -- the outputs -- in more specific and relevant terms than simply the number of school-leavers or graduates at different levels, or the proportion receiving particular grades on some standardized examination. Unless this problem is attacked, there will never be a satisfactory way of judging the efficacy of any particular educational method, or finding ways to obtain the best educational results from the resources available.

- Fourth, a systematic approach can ultimately, if not immediately, yield a way of dealing with costs and efficiency which makes both educational and economic sense. The efficiency of an education system is not an absolute; it is the relationship between the system's inputs and its outputs (judged in relation to its objectives), and it can be changed. If ways can be found to adjust the present process so that with substantially the same inputs the quality or amount of the output is measurably improved, or so that a given increment of resources will yield a more than proportionate gain in educational results, then a gain in efficiency results.

- Finally -- the net result of the foregoing elements and especially important for developing countries right now -- this approach can provide help in bringing about desired educational changes. By encouraging closer and more complete examination of the existing system it can identify the specific things most in need of change and the best leverage points for securing improvement. It can lead to a classification of important objectives which the present system is not achieving and perhaps simply cannot achieve in its present form for various practical reasons. In this event it spurs a search for new solutions, sometimes involving unconventional technologies such as the new media. It provides a clearly defined purpose for whatever innovations are undertaken, it provides an orderly basis for planning such innovations so that they have maximum chance of success, and it provides a rational basis for evaluating their effectiveness in comparison with other solutions.

III

III. Educational Technology: A Brief Compendium

The basic assumption this handbook makes is that technology, if it is to substantially improve learning and teaching, must be embraced in a system -- a redesign of the conditions of learning that integrates the reform of all aspects of education.

Experience has shown that the spot application of this medium or that -- a little television here, some programmed instruction there -- makes scant impact on educational quality. On the other hand, technology wisely planned and applied can act as a catalyst to comprehensive, integrated reform.

Any school system or ministry of education contemplating the use of technology will want detailed information on the various modes available, from experts in the field and especially from experienced educators. What follows here is merely an introduction to the major media, which can be considered tha basic building blocks of educational technology.

The older "new" media

This imprecise category covers technology used in education before the advent of television and computers. It includes 16 mm and 8 mm film and projectors, slides and film strips, the telephone, audio tape recorders, phonographs, and overhead projectors. It can also refer to student- or teacher-made materials which add welcome dimensions of sight, sound, and touch to the subject covered in the classroom. Such aids, many of which have been in use for a long time, include blackboards, maps, pictures, charts, photographs, displays, models, and flannelboards.

Of all the types of educational technology, these are used most frequently. In the great majority of classrooms, they support the teacher in the conventional group-paced, group-prescribed instructional system.

Programmed instruction

Leading proponents of programmed instruction (P.I.) argue that it should not be regarded as one medium of instruction. Programmed instruction, they argue, is a broad concept that may embrace many media. In this view it is a way of planning instruction and designing materials, which uses data from research into human learning, and which requires pre-testing and continuing modification. A television program or a book or any medium of learning can be "programmed." The so-called teaching machine, once equated with P.I., is an optional accessory.

In its most common form, programmed instruction arranges subject matter in a careful sequence, divided into small steps, providing regular opportunities for the student to make responses and to know immediately if he is correct. The student moves at his own pace, instead of the pace of the group; some programmed materials permit him to branch off on different tracks. One of the enduring difficulties that programmed instruction has encountered is the inability of many educators to state their objectives in precise terms.

Language laboratories

The developing world has made almost no use of this valuable, but expensive, technology which is, in effect, a form of programmed instruction. The laboratory consists of a number of sound-proofed booths, each with a tape recorder and headphones and each connected to a master tape-recording console. After listening to an expert rendition of French, English, or whatever language he is trying to learn, the student records his own attempt on his tape recorder, and then listens to himself alongside the "master" recording. He can erase and re-record his own voice without erasing the master recording, so he can improve his performance by trial and error. A teacher sitting at the console may monitor any individual student who is having difficulties, and give help as required.

Radio

Radio, now in its fifth decade of use in formal and adult education, lacks the dramatic appeal of television, and has nowhere yet been used as part of a systematic effort to effect educational change. But radio has certain important practical advantages over television. It is much cheaper, more widely available, much easier to use, and -- thanks to the transistor and inexpensive methods of tape recording -- much more flexible. This vast potential has yet to be tapped -- its use to date, while worthwhile, has been largely supplementary.

Many developing countries where television is confined to a few major cities and their environs can reach outlying rural areas by radio with great ease and relatively little expense. By using cheap support material such as printed texts and pictures, radio can be turned into an audiovisual medium. Radio used in conjunction with specially designed filmstrips ("radiovision") can provide audiovisual instruction at a fraction of the cost of television. Adapting a mass medium like radio to individual educational needs means using it in combination with other modes -- books, monitors, correspondence courses, discussion groups.

Television

Introduced more recently than radio or any of the older audiovisual media, educational television has had a significant impact on the educational systems of a few of the developing countries. Its record in the developed world is not particularly impressive; in the United States, for example, instructional television fills less than 3 percent of total classroom time in the elementary and secondary schools of the nation's sixteen largest cities, according to a 1967 study. Of course it is important not to overlook the educative effect of nonschool television, increasingly becoming the major source of information for citizens in some of the industrialized countries.

With the advent of cheaper videotape recorders, new distribution systems like satellites, cable television, videodiscs, and 2500 megaherz (the frequency reserved in the U.S., for example, for instructional and certain other limited purposes), television is proving to be a flexible technology with varied uses in education. There is increasing interest in the medium both as a way of coping with overcrowded lecture halls and classrooms, and also as a critical agent for major educational reform.

Computers

In strong contrast to audiovisual aids, the computer has not been used extensively for educational purposes in the developing world. In the technologically more advanced countries, the computer, with its unique capacity for data storage and retrieval, has been successfully used as a research tool and as an aid in school and college management. Indeed, computer-managed instruction (CMI) has already begun to realize some of its tremendous potential for assisting educational administrators and managers, teachers, and students.

The computer, when properly programmed, will organize, synthesize, and present relevant information to help guide a wide range of administrative decisions, from those concerned with such logistical problems as adequate use of classroom space, class scheduling, and faculty requirements, to the larger, more complex issues of optimizing learning effectiveness and efficiency, and making learning more individual. Successful use of this technique depends upon adequate programming, which in turn requires a detailed analysis of an educational system -- its people, materials, facilities, and objectives. The computer uses this data to simulate (or model) the possible effects of various options, thus helping the decision-maker to choose and use available resources as wisely as possible. Once a system is operating, the computer can analyze and help evaluate results as they are obtained, thereby providing the possibility of immediate revision and correction. The CMI system can also be made available to the student as a constant advisor, suggesting alternative learning strategies on the basis of the individual's past performance.

But the computer's showing in purely instructional areas (CAI: computer-assisted instruction) is clouded over with frustrations. To date, programs have been largely limited to pure drill and practice lessons; truly individualized programs have yet to be designed; the hardware and software are still in a primitive stage. Computer equipment has not been designed for educational use and its price ranges from high to astronomical. Enthusiasm for CAI stems from potential developments. Preliminary experiments indicate that, as an instructional tool, the computer offers a highly sophisticated machine for the display of interactive programmed materials, and can be in its own right a strong incentive to creative thinking and learning.

* * *

These, in brief, are the communications media which have entered or are beginning to enter educational systems. Each has many variations, and multiple uses. None of the media are fully developed, but subject to continual modification and refinement. They are the raw materials of educational technology. By themselves, their educational validity is limited. Integrated within a well-thought-out system of education, and orchestrated with other media, old and new, human and nonhuman, their potential for improving instruction and learning could be tremendous.

IV

IV. Case Studies

Around the world, in nearly every country, in one form or another, technology is being used to some extent for education. A survey of educational technology in practice can be no more than impressionistic at best. Objective, reliable, and up-to-date information on school and college use of technology is scarce. Projects that open with a flourish one year disappear from sight a few years later as funding runs out or political administrations change. Judgments about the effectiveness of the various systems are difficult to make even for trained investigators after first-hand observation. Data on student achievement are scanty, utilization rates for equipment are usually unavailable, costing methods tend to be arbitrary and reveal only what the money was spent on (teachers' salaries, film projectors, for example) and not what the money was spent for (teaching reading to eight-year olds, for example).

Educational traditionalists who interest themselves in technology seek answers to what reformers would consider the wrong question: "How can we help the teacher?" In most parts of the world technology is used in this educational context, and the various media are construed as aids to the classroom teacher. Whether or not the teacher uses these "aids" hardly affects the kind or amount of learning that takes place.

In contrast, the new approaches focus on the needs of the student, and ask a different question: "How can we help the learner?" In the few places that reflect this approach, technology has become a catalyst for change and a critical element within the changing system. Removing it would make a significant difference to teachers, to administrators, and to students. This is perhaps the most important distinction to be made between the two approaches. While it would be foolish to under-value aids to teaching (characteristic of instructional technology in all the "advanced" countries), it is technology organized to significantly improve learning that this handbook stresses.

* * *

What has educational technology got to offer education? Can it help to solve the quantitative and qualitative problems facing education in developing countries? Can it help to modernize the curriculum, make education more responsive to individual students, reach more people more efficiently, free teachers to teach -- all at costs that are competitive with more conventional remedies? There are no simple nor incontrovertible answers to these questions. There are, however, enough projects now in operation to reveal some definite trends and offer some provisional answers.

Although education will always be an essentially human, and therefore unpredictable process, schools and universities, squeezed by rising costs, enrollment, and demands for quality, cannot evade the quest for greater efficiency of operation. While educational technology is no instant cure for the educational crisis, there is evidence that it can increase the efficiency and productivity of education. It can, for example, multiply the impact of that most scarce of resources, the really effective teacher.

Although a list of countries employing technology for isolated educational purposes would be lengthy, and would cover all continents, the number of countries using technology as part of a fully integrated system for improving education is brief. Following are case studies drawn from the few places where television is being used in this way: El Salvador, Niger, and American Samoa (the first two are illustrated in the film), plus certain other impressive though less systematic applications of ETV (Mexico, Singapore, and Colombia).

El Salvador

> We see that television is not only a medium of instruction but a catalytic agent for change in the system. A major technological change has forced its own logic upon those who had decided to use it. El Salvador's educational leaders seem to have understood and accepted the implications that this innovation has for structural changes that go far beyond the placement of a piece of hardware in the classroom. There have been no other tests on a national educational system of the kind that is under way in El Salvador. To our knowledge no other country has accepted so completely the implications that educational technology carries with it. We are in the process of studying an important test case to see whether television's role as catalyst for systemic change as well as instructional medium for the classroom will achieve positive results.*

El Salvador is the smallest (21,393 square kilometers) and most densely populated (147 people per square kilometer in 1967) continental country in the Western Hemisphere. In 1968 after an intensive examination and evaluation of new educational problems, El Salvador initiated a systematic program of school reform built around television. The U.S. Agency for International Development (AID) gave substantial assistance to this program in the form of loans, grants, and expert advice. After careful consideration, planners chose the junior high schools (Plan Basico) as the best place to begin the new program. The relatively small enrollment of seventh through ninth grades -- 40,000 students -- would be a good initial population; all could quickly receive the new educational opportunities provided. During the 1969 school year (February 1 to November 1), teacher training and retraining, program and materials development, supervisor training, curriculum reform, and evaluation were begun, and lessons were televised to 32 seventh-grade classrooms.

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*Television and Educational Reform in El Salvador, Complete Report on the First Year of Research, Emile G. McAnany, John K. Mayo, and Robert C. Hornik, Institute for Communication Research, Stanford University, July 1970, p.7. This case study is based on the information in this and later Institute for Communication Research reports prepared on behalf of the Academy for Educational Development, under contract with the U.S. Agency for International Development.

During the 1970 school year the new curriculum and associated teaching materials were installed throughout the seventh grade, and television extended to all seventh-grade classrooms capable of receiving it. Meanwhile, extensive teacher retraining continued, TV was introduced into 32 pilot eighth-grade classes (eighth-grade curriculum had been revised), and plans made to install the reform curriculum in the remaining year of Plan Basico and in grades one through six.

Background

The idea of using television as a means of educational reform for El Salvador took root in 1967 at the meeting of American Presidents at Punta del Estes in Uruguay. Improvement and extension of educational opportunity received high priority, and President Fidel Sanchez Hernandez of El Salvador expressed deep interest in undertaking the development of an educational reform program which would enhance the learning of Salvadoran children through the use of television. Part of the Salvadoran enthusiasm for this technique stemmed from Mr. Walter Beneke, Minister of Education. While Ambassador to Japan, Mr. Beneke was impressed by the Japanese use of TV for education and felt that Salvador could profit greatly from this example. Promising to raise as much money as possible in El Salvador, President Sanchez asked President Johnson if the United States would assist with the rest of the financial burden. By February 1968, an agreement was concluded.

Objectives and Priorities

The educational reform ultimately undertaken by El Salvador was a response to serious problems that faced the economy and the school system in the sixties. El Salvador's planners and educators realized that their educational system was failing in its two stated aims:

(1) To give an integral formation of the personality of students, instilling in them a deep sense of human solidarity;

(2) To be a basic factor of social and economic development through an adequate, opportune, and efficient preparation of students.

Salvadoran educators realized that Salvadoran children were not receiving the kind of education they needed and deserved, and that the whole country was suffering and would continue to suffer from this failure. In particular, the growing economy lacked qualified people for middle-level management positions. As Minister Beneke put it, the schools were geared to turning out "human archives."

To realize the aims of education would require a concentration of energies on a national level. Until this was achieved, the desired result -- a beneficial change in students in or out of the classroom -- would not materialize. Accordingly, El Salvador's educators decided in general what they wanted to do:

- Increase the efficiency of the entire educational system;

- Improve the quality of teaching at all levels;

- Strengthen and extend secondary education -- offering a multi-disciplinary curriculum so as to prepare students for vocations as well as university careers;

- Extend education to more students at all levels and, particularly, produce more junior high (Plan Basico) graduates;

- Revise and improve curriculum of grades one through 12 throughout the system.

However, such goals could not all be met at once, and in balancing one against the other, priorities were arranged in an order which reflected both the urgent need for solution and the capacity of present or soon-to-be available resources to meet the problems quickly.

The school system of El Salvador encompassed, in 1968, some 515,000 students, approximately 90 percent of them in the first two grades of primary school (educational attrition commonplace in the developing world). At the next level, Plan Basico, there were some 40,000 students. Even more telling statistics, however, concern teacher training: in 1967, with more than 5,000 primary school teachers unemployed, there was a shortage of qualified secondary teachers: only about 20 percent of those practicing had received necessary advanced training.

Since Plan Basico graduates determine the number of young people going on to further education as well as the number ready to fill jobs vital to El Salvador's growing industries, it was decided to begin educational reform in Plan Basico. Traditional education at this level impressed a knowledgeable outside observer as follows:

> For students in El Salvador, the typical Plan Basico room had been a dreary place, both visually and intellectually. Aside from a single blackboard, its walls were generally bare, save for an occasional calendar, religious picture, or map.
>
> Invariably seated in rows, students were expected to listen while the teacher lectured or read from a textbook. When they were not listening, students copied dictations or resumes. If the teacher asked questions, they were usually

"memory questions" (e.g., who discovered El Salvador; when was Columbus born?). Students were almost never prompted to venture an opinion, to participate in discussions, or even to ask questions of the teacher.

Because of the scarcity of textbooks and school libraries, the teacher was the students' sole source of information. Students passively absorbed this information and were expected to regurgitate it verbatim on examinations.

Little attempt was made to relate classroom learning to the students' environment and experience or to their interests and needs. Knowledge was treated as a fixed body of concepts and facts to be memorized; the sole arbiter and dispenser of knowledge was the teacher.

Progress to Date

The first three-year phase of the program is now nearing its end and will be in full operation by 1972, when 40,000 seventh, eighth, and ninth grade children will be in classes taught by retrained teachers and will be using a modernized curriculum incorporating television. At the beginning of the 1971 school year, about 24,000 seventh, eighth, and ninth graders in some 150 schools were participating in the program.

El Salvador's project is outstanding because it is all-embracing. Television has not merely been inserted into an outmoded curriculum taught by tradition-bound teachers. Rather, the reformers have tried to design a system which more closely meets the individual needs of each student and the general welfare of El Salvador.

Classroom Scenario. Because the purpose of the reform is to make new and better things happen in the classroom, it may be helpful to see how classrooms are changing as they experience television and other aspects of the reform.

In September 1968, following the inauguration of a new studio at San Andres (not far from the capital, San Salvador), work immediately began on the five series of programs which were to be aired in 20-minute lessons 14 times per week to 32 seventh-grade classrooms beginning February 1969. In this first year, student response and performance would be analyzed and, at the same time, the performance specialists would gain experience and confidence in their jobs, thus preparing insofar as possible for smooth operation and good results when TV took on large-scale proportions a year later. From the outset, there was a TV in every classroom, and televised lessons carried the burden of the instructional lesson in every subject.

The cautious approach to program production was wise. Mistakes and false starts, predictable enough, could be corrected before programs were broadcast throughout the school system. In the year's trial run, the crew at San Andrés achieved a coordination of diverse tasks and talents that would have been difficult in a "business as usual" atmosphere. Among other things, they learned to prepare scripts far enough in advance so that the graphic artists and other specialists could prepare congruent visual materials, and take account of scheduling factors that made for a well-coordinated program. Thus, through experiments, trial runs, and learning from mistakes, the TV production staff gained experience for the official beginning of the ETV project in February 1969.

Concurrent with program production was the preparation of student workbooks and teacher guides keyed to the

ETV programs. For each lesson the production team produces a teacher's guide and a student workbook. The teacher's guide defines the objective of each lesson, lists materials that will be needed in class (for demonstration, experiments, etc.), offers suggestions for warm-ups before each lesson, and suggests post-TV activities for the students and the teacher. Teachers, who might have seen the new system as a threat to their status, were encouraged to prepare their own classroom plans and to see themselves in a more human, innovating role than the traditional classroom allowed.

Each student receives a workbook which serves much the same purpose as the teacher guides. It relates to the TV program and prepares him for the lesson that is to be broadcast. In effect, he makes his own text -- and Salvadoran schools had been severely lacking in texts or books of any kind.

Every effort is made to ensure regular delivery of these critically important program materials. Salvadoran TV sometimes suffers electricity blackouts that disrupt programming completely. If the teacher and students have appropriate materials in hand, they can still go ahead.

In a typical class, each television lesson is preceded by at least ten minutes of introduction by the classroom teacher. The purpose is to rouse the students' interest for the lesson to come. The classroom teacher might, for instance, teach the class new words that will be used by the "telemaestro" (television teacher).

Following the televised lesson, the teacher and students participate in questions, demonstrations, and discussions. The emphasis is on an informal relaxed atmosphere where learning can take many forms.

Administration and Organization: Television has widely affected the organization of the school system. The centralized Plan Basico classes have relieved school principals of scheduling problems and have helped to eliminate the "taxicab" teachers who used to run from school to school teaching seventh-grade math or eighth-grade geography in perhaps three or four locations per day. For the first time, there are full-time teachers in Plan Basico public schools.

In the ministry, a basic reorganization, beginning in 1967 and now completed, greatly facilitated educational reform. Educational television was set up as a separate section within the ministry structure. This independent status gave it the freedom and flexibility to develop in its own way, unencumbered by the traditions and rigidity that often plague established bureaucracies.

Curriculum revision: One of the most significant actions taken by Minister Beneke during the first year of his administration was the appointment of a national commission to reform the curricula for grades one through nine. Armed with the results of an elaborate teacher survey conducted in the fall of 1968, the Commission of Plans and Programs set forth guidelines for a new national curriculum which, for the first time, included consideration of objectives, activities, teaching methodology, guidance, and evaluation. The commission's guidelines became the basis for the actual rewriting of all curricula by subject and grade level. By the end of the reform project's first two years, the new curricula had been completed for the seventh and eighth grades (the first to receive televised instruction), and the curriculum specialists were turning their attention to the ninth as well as to the primary grades. Salvadorans have come to believe that revision and updating are essential, continuing processes.

Teacher training: Prior to reform, teacher training institutions failed to produce qualified secondary school teachers whereas official, semi-official, and private normal schools trained primary teachers far in excess of the national demand. A drastic reordering of priorities and programs was needed to remedy these imbalances. As a result, Minister Beneke made the bold decision to close most existing normal schools, thus stemming the tide of primary school teachers.

How to provide the required secondary teacher education, however, was not immediately apparent. The cost of retraining all secondary teachers (and some primary school teachers) would be high, yet to replace the existing teaching force with younger graduates of an expanded Superior Normal School threatened human and political damage. The first strategy (i.e., to retrain) was finally adopted.

Teacher training was concentrated at San Andrés with the hope that at least all Plan Basico teachers could be retrained over a period of three years. The first course was for only three months; the graduates taught the first 32 classes and were to become the first group of supervisors. After that each Plan Basico teacher was required to attend a nine-month course at the new normal school. During the first year's course, 260 teachers received special training in their field of specialization (either social studies and languages or math and science) as well as instruction in teaching methodology (including TV utilization), guidance, and evaluation. Teachers received a full salary as well as room and board during their course of study. A rotation scheme was worked out to make replacements (mostly recruited from experienced primary teachers) available to those schools which had teachers attending the San Andrés program.

The importance of retraining teachers to the overall educational reform cannot be overestimated. Beyond the specific objective of preparing qualified secondary teachers, the retraining courses seem to give Salvadoran teachers a new professional self-respect -- doubly important in a time of massive educational change. Bringing teachers thus into active participation in the educational reform has produced better understanding and acceptance.

Other important components of the reform:

- Developing workbooks and other teaching materials;
- Training a cadre of Salvadoran specialists to carry on with every phase of the new education

program when the specialists provided by the AID Mission are withdrawn (there were 14 original advisors);

- Establishing a testing program within the educational system which, when finally developed, will measure achievement year by year and which will also provide continual feedback on the effectiveness of the new program.

One of the most thorough research and evaluation programs ever attempted on an educational technology system yielded the following conclusions on the new system after the first two years in operation:

A. Some general effects of the instructional television system

1. Among the most important long-range effects that the adoption of instructional television (ETV) seems to be having in El Salvador are the changes in other parts of the educational system that a thorough-going acceptance of the technology implies: i.e., curriculum revision, teacher retraining, new supervision and evaluation systems. TV has indeed acted as a catalytic agent to spur educational reform and innovation.

2. Attempts to separate out the learning effects of television per se, as distinct from the other components of the educational reform (retrained teachers, new curriculum, new classroom materials, etc.) have been inconclusive. Comparisons between achievement in television classes and the control classes (which embodied every component of the reform except TV) showed a slight trend in favor of the television classes.

3. TV in the classroom spurs change from the old system where the teacher is the sole source of information and learning consists of passive memorization. It provides alternative information sources (television teacher, printed materials, group activities, experiments).

Active participation by the student encourages him to learn and understand more.

B. Student learning and ability

1. In both years there were substantial learning gains recorded in all subjects throughout the seventh grade, and significantly larger gains in the television than the traditional classes. When comparisons were made in 1969 on questions common to both the old and new curricula, television classes showed about a 20 percent advantage over a sample of traditional classes on end-of-year tests in all three tested subject matters. The advantage (TV vs. no TV) was slightly less in 1970, since by then all seventh-grade classes were using the new curriculum and materials (although not all had television), and some had retrained teachers as well. In brief, El Salvador no longer had any truly "traditional" seventh-grade classes.

Results in the pilot eighth-grade classes of 1970 -- the seventh graders moving up -- were less encouraging. The reasons, as finally analyzed, came from unforeseen contingencies. (See below under discussion of problems.)

2. In the first two years, learning from television did not show large differences for various subgroups within the school system. Everyone in TV classes, whether rich or poor, from the city or the country, male or female, with high or low ability, gained almost the same number of points on the end-of-year achievement tests in mathematics, science, and social studies. Fears that TV would be non-egalitarian in its effects -- that only the students with advantages to begin with would benefit from it -- did not prove to be true. In fact there are encouraging indications, though no conclusive evidence, that the reform may be narrowing the gap.

C. Student attitudes and aspirations

1. Students' attitudes toward the new system in general and TV in particular were highly favorable in both 1969 and 1970. The new system also gained favor in classes without television, although attitudes were less favorable than those in ETV classes. However, they too became slightly more favorable by the end of the year.

2. Nearly three-fourths of Plan Basico students in the study sample already have more education than their parents and are aspiring to considerably more. A sample of students in their last year of Plan Basico (ninth grade) manifested high aspirations to continue on to the university and to enter already crowded professions. Fifty-five percent of the seventh- and eighth-grade students want semi-skilled jobs at least -- almost 40 percent of them professional occupations. By contrast, 70 percent of their fathers work in unskilled jobs, only 10 percent in skilled jobs, and a scant 1 percent in professions. A bottleneck at the university level, and frustration of high-aspiring secondary students are potential problems.

D. Dropouts and failures

Students in television classes had lower dropout and failure rates for the school year than did the sample of traditional classes. Attendance data were too unreliable in most cases to make estimates for either group.

E. Teachers' attitudes, procedures, and classroom interaction

1. In 1969 teachers using television in their classrooms for the first time showed favorable attitudes toward television instruction at the

beginning of the year and even more positive attitudes at the end. Two other teachers' groups in retraining, who had not yet used television, were more skeptical but still positive in their attitudes toward ETV. In 1970 attitudes were slightly less favorable than the first year. Apparent reasons for the slight decline are discussed below under "Problems."

2. During the first year of reform operation, it was clear to observers (though scientifically unverifiable) that classes under the new system tended to be livelier, visually more appealing, and intellectually more challenging than the old-style classes. In 1970, the evaluators developed an "observation form," simple enough to be used by supervisors not trained in research, to measure what was actually happening in the classroom. The results thereby recorded are encouraging -- "no giant leaps forward," in the words of the evaluators, "but a steady, consistent move toward modern styles of teaching." In general, the record showed that in the new-system classrooms as against the traditional classes there was less lecturing, more questions requiring thought rather than memory, more discussion, more individual study, and more use of audiovisual aids.

F. Feedback

In 1970, the Salvador reform was able to go beyond the conventional kind of feedback provided by most ITV -- brief questionnaires giving the classroom teachers' opinions of different televised courses. The Salvador researchers devised a system for making tests and administering them over TV, in such a way as to get the results to the studios in time for any necessary revisions. More important, the information provided was what television teachers and production teams need most: how much are the students learning? The feedback system, inaugurated in 1970 in two subjects, brought results back to the studios within three days at most. In 1971 it is being expanded to as many subjects and course units as possible.

Problems

The best-laid plans of El Salvador's planners and their advisors met unforeseeable obstacles in the first two years of operation, illustrating the general points made in this respect in Chapter II. This occurred despite the generally favoring climate and conditions in which the school reform program was created. Among the difficulties were these:

- The eighth-grade extension of the reform was hobbled by late completion of the new curriculum, production teams with insufficient experience, and crowded conditions in the San Andrés studio which often meant 12-hour working days. No scheduled broadcasts were missed, but the pressure often diluted the quality of the programs.

- Protracted delay in activating a $1.9 million U.S. loan -- finally ratified in 1970 -- meant that the new Santa Tecla studio complex could not be completed in time for the 1971 school year.

- A new supervisory system -- designed to substitute advice and assistance for punitive surveillance -- was almost negated during 1970 by administrative complications (a problem now apparently resolved so that an effective corps of supervisors will be at work before long).

- Somewhat greater teacher resistance during the second year of reform than in the first was due in part to the difficulties mentioned above.

- Development and maintenance of high-quality programs were also impeded by these pressures and problems.

Future Plans

El Salvador plans to extend educational reform into the primary grades and the high schools (which will place increased emphasis on vocational and technical training) in the years ahead. In addition, many more primary school classrooms will be built.

Although behind schedule because of delays over loan arrangements, the reform continues to move ahead strongly. By 1972, TV will have been installed throughout Plan Basico, most of the 900 Plan Basico teachers will have been retrained, and over 500,000 students from grades one through nine will be using the new curriculum.

Historical and administrative records are being kept on the development of this project in the hope that these may be useful to other countries planning major changes in their educational systems, especially the use of instructional television. These must be interpreted with greater perspective than is now possible, but one conclusion that emerges strongly is the importance of planning and preparation before a new system gets under way. This project has roots reaching back three years before televised instruction began in the classroom. Another important aspect of planning and meeting objectives is the strong backing the project has received from the central government and the Ministry of Education.

Meantime, the researchers will try to establish permanently the two operations especially developed for El Salvador: student-learning feedback and classroom observation. The research and evaluation in El Salvador will continue, with new instruments and added questions still to be answered.

There are many questions which require more time and greater perspective. It takes years for certain changes to occur, and for researchers to ascertain, analyze, and understand those changes. Furthermore, the systematic nature of the Salvadoran reform means that there are complicated interactions that require special study.

Educational planners and innovators need to know more about the system, such as:

> What are Salvadoran children being educated for?
>
> What will students do when they finish Plan Basico? Will they try to continue in school, seek some type of employment, or will they find themselves unemployed? In other words, if Plan Basico is judged more successful, attractive, and effective because of educational reform, will it be for the good of the students and the country? Or will aspiring students find an unbridgeable chasm between available prospects and the kind of life and work they seek?
>
> What are the separate efforts of television within the context of the whole reform?
>
> How much does television help the students in classes taught by poor teachers?
>
> How much, if any, of the reform program could have been instituted without TV?
>
> Is the achievement gap between the advantaged and disadvantaged being closed, widened, or maintained under the reform plan?
>
> How effective will the reform be when it reaches all the way down into the lower grades?
>
> How can the critical processes of continual revision and improvement be permanently built into the system?

In the next few years the evaluation team will follow up the classes they have already studied to see if their initial findings are valid. Furthermore, new and as yet unanswered questions will be probed so that the full history and lessons of El Salvador's reform may be known -- the full variety of opportunities and problems that have confronted this tiny country and are likely to confront the planners of other developing countries as they attempt to institute their own educational reform.

Niger

Niger's experience with educational television began -- and, unfortunately, continues -- as a pilot project. Planned in 1963 and introduced in 1964, Television Scolaire du Niger (TVSN) has transformed the education of only about 800 primary school children in 22 one-room schools near Niamey, capital of this small, dry, landlocked country in northwest Africa. But it has been a real transformation. It was the first instance of an African country using TV to give young students complete instruction and it was the first time a TV/classroom monitor was implemented to offset a chronic lack of qualified teachers.

At the outset, Niger planned to extend the TV experiment to 300 classrooms by 1967-68 and to 500 classrooms (40,000 students) by 1968-69. However, for a complex of reasons, there has been no expansion to date.

The primary objective of the Niger program was rapid expansion of primary and secondary school enrollment despite an anticipated shortage of qualified teachers. It is estimated that Niger, with some 700,000 school age children, only has enough teachers, facilities, and materials to accommodate 10 percent of that number. Other objectives included testing the hypotheses that:

1. creative use of television that is educational and entertaining can stimulate children to want to learn;

2. monitors with minimal training -- most with only a sixth-grade education plus a three-month training course -- can be effective classroom coordinators in a well-planned TV system;

3. students, most of whom speak one of five local Nigerienne languages, can learn their lessons

in French without previous experience in its written and spoken use;

4. TV will help reduce the serious dropout and repeater rate which afflicts Niger in common with almost all developing countries.

President Diori took the initiative in the plan to improve education through television in Niger, and the French provided funds, technical assistance, and staff. A French team, established in Niamey in 1964, plans and produces the programs; Nigeriennes supply logistic support, technicians, classroom monitors, and studio teachers. The Niamey studio employs a staff of about 120, 53 of whom are French and supply most of the creative inputs. The remainder of the staff are Nigerienne and fill supportive positions.

Early in October 1964, the project's directors selected and trained monitors, and chose pupils for the first two experimental one-room schools located next to the studio complex. In November of that year these classes saw the first of the 400 television programs in production. At the end of the school year, the production staff reviewed the entire series, and on the basis of pupil reactions, decided which to reuse and which to alter or change completely.

The next year twenty more schools, enrolling 802 students in all, received the television programs. By December 1970, children in the two original experimental classes had experienced four years of television-based primary school, and pupils in the twenty others three years. Each school has moved up a grade each year. Because the experiment has not been expanded, the number of students remains static. The two original classes have completed their TV experience.

The 20 monitors (usually young men with not more than a sixth-grade education) were selected mainly for their general enthusiasm and alertness, desire to learn, and love of children. In fact, in their three-month training course, probably the most important thing the monitors learned was to simply love their classroom children. The television courses and guidebooks provide the basic instructional material that the monitors use. The guidebooks suggest questions, projects, games, etc., geared to each particular series of lessons. The monitors prepare classes for the lesson, follow it up, and assign related activities geared to individual pupils. The unusual cooperation and lack of competition between television teachers and the classroom monitors leads the children to regard them all as equally important.

Programs are designed and planned by an international team of psychologists, ethnologists, sociologists, educators, and media specialists who rely heavily on the feedback on programs that they get from monitors and children alike (the information is conveyed to the studio by one person who periodically visits each school). For the most part, because of the classroom freedom generated by the monitors and the entire program, these opinions are often quite candid, and, therefore, very helpful to the central production team.

Some programs, staged in an outdoor studio which consists of a cluster of native huts, reflect local life. Other programs use imaginative, and quite inexpensive, animation, graphics, geometric effects, and lighting. All programs are designed to present broad ideas, concepts, attitudes, and to utilize objects and knowledge with which the children are already familiar. Lessons, conducted in French, include both spoken and written French, math, and environmental studies. They differ sharply from the lessons of traditional classrooms. Seldom does a lesson consist of the TV teacher delivering a lecture. The emphasis is on active participation (in games, dramatic sequences, etc.), open questions, problem solving, and encouragement of the desire to learn.

In a typical Nigerienne TV classroom, the students sit on clay floors in concentric circles around the TV set. The set, itself, is low enough off the ground so that, on certain occasions, the children can carefully draw on the face of the TV set. While math or calcula lessons are aired, the children will often do multiplication problems on their own on the clay floor at their feet. After the TV lesson, the children will participate in an activity -- with the helpful guidance of the monitor.-- which relates to the lesson they have just viewed.

All programs include instructions which the monitors receive well in advance. Revision of telecasts (80 percent the first year, 70 percent the second) includes complete revision of these instructions as well.

The schedule of telecasts varies with the age and ability of the students. In general, the younger groups receive fewer than the older ones because the directors believe the former need more time for reflection and independent work. A typical class for older students includes four 14-minute TV lessons per day, five days per week.

Results

That the experiment has not to date expanded beyond the 22 schools is discouraging. Although the Nigerienne government has asked that it be extended to the fifth primary year, the pilot experiment remains just that, and its survival, much less expansion, depends on extensive foreign funding, and as such is dubious. No one knows what will happen after October 1972, the date the experiment is now scheduled to culminate. However, its achievement though limited in extent has been impressive. It is significant that all people concerned with education in Niger (the President, the Ministry of Education, and the Office of the Commissariat General for Development) openly recognize the effectiveness of the TV experiment.

One measure of the success of the experiment is the very low attrition rate within the TV classes themselves; out of more than 800 pupils, none left by virtue of academic failure, while the average rate of repeaters in the traditional classes is about 25 percent.

As for the student achievement: the system's most important job in the experiment has been to teach the children to communicate in French, the national language. Nintey-six percent of the pupils in TV classrooms passed a French language comprehension test after the third year, and 60 percent passed a test of expression. Traditional classes made a much poorer showing.

Equally impressive if unmeasurable, is the effect that television seems to have on the children as human beings. According to a UNESCO report:*

> In the conventional classrooms, students were passive. The student-teacher relationship was traditionally autocratic, with one-way teaching. Television classes, on the other hand, showed lively student participation -- to some extent during the telecast and to a much greater extent in the following period, with spontaneous monitor-student and student-to-student interchanges...
>
> Ranking educators /who have observed the Niger experiment/ stress the fact that the use of television results in over-all motivations which enrich personal sensitivity. They spoke of "a personality explosion" among the children submitted to this type of education, and of an actual artistic revival among Niger youth.

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*Education by Television, 1968-1980, Volume III. The Ivory Coast Republic, Ministry of National Education, March 15, 1969, p. 16 and p. 19.

American Samoa

American Samoa, which consists of seven islands in the Pacific, south of the equator, was the first country in the world to undertake a comprehensive educational reform based on television. In 1961 the Governor of American Samoa decided to upgrade the Samoan educational system to a level comparable to that of the mainland. The major impetus behind this decision was the fact that approximately 40 percent of Samoan high school graduates leave the island to take jobs in Hawaii or in the United States, and that the remaining 60 percent desperately need preparation for more fruitful and productive lives on the islands.

Samoa's estimated population in 1970 was 28,000. In addition to the 28,000 Samoan residents, an estimated 22,000 Samoans lived in the United States or elsewhere. In 1970, public schools enrolled approximately 10,000 students, and church schools, 1,800. School attendance is compulsory until students complete grade 12 or reach eighteen years of age.

According to observers, the traditional Samoan educational system had no acceptable school plant, organization, teaching staff, nor administrative structure; no discernible educational goals; and only the vaguest form of curriculum. The 43 village elementary schools, scattered throughout the islands, were dilapidated. The Samoan classroom teachers, themselves products of Samoa's public schools, averaged only a fifth-grade education by comparable American mainland standards. English was the medium of instruction in the schools; yet the Samoan teachers understood and spoke it poorly. There was little or no systematic supervision or in-service training. The school textbooks were produced on the mainland for mainland children and, therefore, were thoroughly inappropriate for the Samoan child. In addition to these and other qualitative defects, only about one Samoan child in four obtained any sort of secondary education.

One obvious solution to many of Samoa's educational problems would have been to replace the Samoan classroom teachers with teachers from the American mainland. But such a scheme, in addition to its obvious expense, would in no way have contributed to the acknowledged goal of self-government for the colony. Samoan teachers, traditionally regarded as personages of prestige in the Samoan culture, would be dismissed en masse. Such a massive disruption of the social-cultural-economic balance of the islands could in no way be justified.

Alternatively, a long-term plan could have been initiated for training future Samoan teachers in the United States. This would have produced a good group of Samoan teachers ready to start work back home in the mid-1970s. However, it would not have dealt with the immediate problems of Samoan education.

With a team from the National Association of Educational Broadcasters in Washington, D.C., the Governor worked on another solution designed to produce more immediate results: the use of television on a large scale; not as a supplement, but as the core of a completely restructured educational system. The Samoan teachers, instead of being replaced, could be reinforced by good teaching via television. The Samoan classroom teacher and the American television teacher could work side by side in a technological version of team teaching. Television would serve the dual function of teaching the students and upgrading the Samoan teacher. It could be designed to do both simultaneously, thus reducing the time taken by more traditional reforms which first teach the teacher and only thereafter allow the teacher to teach the student.

Because American Samoa is an American territory, the final decision to use television as the main component of a new educational system was made by the Governor of the islands with the U.S. Congress approving the necessary funds. Unlike Niger, where the utilization of ETV was, and still is, a joint enterprise between the Nigerienne government and French advisors, in American Samoa the decision to use ETV was imposed on the Samoans by an American administration. This is not to imply the decision was a bad one. It is important to note, however, that Samoan education, just as other components of her culture, has suffered a long history of abrupt changes, most imposed by outside forces.

In October 1964, the first three channels of KNZK-TV began broadcasting to a limited number of elementary classrooms. A year later, three additional channels began broadcasting to secondary schools.

The studio production team in Pago Pago now produces as many as 200 class programs a week. Telecasts are taped, for scheduling purposes, but most are erased immediately after broadcast so the tape can be reused. As the level of language competency has stabilized over the past seven years at lower elementary levels, it has been possible to use televised materials more than one year. There are nine permanently taped courses presently on hand with plans to increase that number as teachers and funds for purchase of tape become available.

The basic curriculum, lesson plans, and student worksheets for most subjects are written by the ETV studio staff, and distributed from the central source. A lesson consists of: a 5-minute introduction by the classroom teacher; a presentation and demonstration by the television teacher ranging from 8 minutes for primary classes to 25 minutes for secondary; and a reinforcement segment by the classroom teacher ranging from 10 to 20 minutes.

The supply of locally written and published materials has increased over the past six years, as has the range of textbooks, maps, models, and science equipment purchased from outside sources. Recently, efforts have been made to form a consortium with Guam, Hawaii, and the Trust Territories of the Pacific to share materials, information, and testing results.

Through the basic curriculum in the elementary grades -- language arts, mathematics, science, art, and physical education -- English-language proficiency is stressed and developed. At the secondary level, home economics, general shop, and business courses are offered, and at the post-secondary level a comprehensive vocational education program is available, which includes teacher training, business office services, and training for careers in medical and technological fields.

The goal of the curriculum of American Samoa is to produce bilingual individuals equipped with the skills necessary to pursue independently their educational and vocational aims and capable of solving the problems of survival in a rapidly changing world.

At present, English is a major medium of instruction, and proficiency in the English language is a basic component of the curriculum. However, the Samoan language is formally taught to first-and second-grade children as their first reading and writing experience, and plans are underway to extend bilingual education beyond the second grade. Also, the twelfth-grade TV course "Samoan Language and Culture" is presented in Samoan. Classroom teachers are urged to use Samoan as an instructional medium, according to their own assessment of the needs of the students.

The Samoan child is expected to master English to a degree that allows him to compete academically with students of the United States. However, he finds himself living in a society that discourages the use of English outside the schoolroom.

Recent evaluations indicate that the system has been successful in raising the level of English language proficiency and general academic achievement in the primary grades and that test scores of incoming ninth-grade students have been higher each year. At the secondary level, however, SRA test scores indicate that the average Samoan high-school graduate is some five years behind his stateside counterpart in achievement.*

Low high-school achievement scores of secondary school students in English speaking and comprehension are echoed in low scores in other subjects. These scores, because they are based on stateside norms, probably underestimate the true level of Samoan pupils. Nevertheless, there is little doubt that the great majority of current Samoan high school graduates are inadequately prepared to compete in an English-speaking society.

Tests also show that students with the longest exposure to the present system and its integral use of television as a means of instruction do best, and those with the least experience, poorest. The graduating seniors in 1970 were in the seventh grade and at least 13 years old when the new system started. Many were older. Most language-learning theorists believe that a sharp decrease in language learning ability occurs with the onset of puberty; thus the secondary-school students were operating under a handicap in a second-language learning situation.

In essence, the current problem at the secondary level in American Samoa appears to be more indicative of a group of students caught in the shift from one educational system to another -- rather than a problem precipitated by a particular method of instruction. Two principal factors contributed to this problem: First, all grades started using ETV almost simultaneously, thus placing a heavy load on the teachers, students, and educational producers; and secondly, much of the available manpower was expended in the constant (yearly) revision of the broadcasts. The heavy broadcast load (each teacher/producer prepares 10 to 15 programs per week) and accompanying distributive activities (almost one million pounds of paper are used annually) have overshadowed the needed emphasis on optimal professional quality in broadcasting.

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*The SRA (Science Research Associates) high school placement test. It should be noted that the SRA tests are not based on Samoan culture or curriculum. A testing development program is presently underway to provide comparative data on a local basis and for the Pacific region.

Secondary schools all over the world have more serious problems in using television than do elementary schools, and teenagers have frequently rejected television even as an entertainment medium. This, of course, complicates the problem. In Samoa, TV has been de-emphasized in all secondary school courses and TV is not used as a resource in secondary-school English classes. U.S. teachers were hired on contract to teach both English Language Arts and English as a Second Language. The system is presently trying to solve the problem of designing an effective strategy for using human and media resources at the secondary level.

One problem that American Samoa has experienced in the reform is the inability of the system to meet the vocational needs of its people. In an effort to strengthen the academic side -- which badly needed strengthening -- too low a priority was initially assigned to the vocational programs, and more generally, to what Samoan children would do with their education once they graduated from school. In 1970, a greatly expanded vocational educational program was instituted.

The major problem confronting the system now is a lack of community support. Television, once seen as the almost magical solution to a whole range of complex social, political, economic, and educational problems, has become the scapegoat for all of the system's educational ills. TV is perceived as an inferior form of education (based on the elite Samoan's memory of the stateside or private school textbook lecture form of education that he received), and as a single, simple cause for low classroom teacher salaries and the poor academic showing of past high school graduates who attended stateside colleges on scholarships. Recently the removal of TV from the educational system was an issue in a political campaign. Obviously, not enough effort has been spent in keeping the public informed about the educational system, its goals, its problems, and the rationale behind its operational procedures.

The system, however, as it operates today, is much more than just television. Television is part of, and an enabling agent for, a total concept. This concept includes curriculum reform of a comprehensive nature, a shift from rote memorization to a more conceptual type of learning, the production of instructional materials in print and nonprint which do reflect the Samoan environment, a very complete administrative and logistical reorganization, the construction of specially designed schools which express the Polynesian culture but also meet the requirements of television, a school lunch program, systematic teacher supervision and in-service training, and a $100,000 scholarship program for Samoan high school graduates wanting to attend college in the United States. To think that education in American Samoa has been changed only to the extent of having a few TV sets in each school is quite wrong. What has happened in American Samoa during the last few years is a major overhaul and redesign of education on a far more comprehensive basis than probably any "advanced" or "underdeveloped" country has ever known.

Some major changes have occurred in the Samoan educational system as the level of English fluency and staff expertise has risen, including: (1) increased emphasis on methods and techniques for individualization of instruction, (2) more reliance on instructional materials designed and produced outside of Samoa, especially at the secondary level, (3) expanded curriculum to include physical education, vocational training, early childhood education, and (4) a community college which began operation in 1970. There has been a shift from specific lesson plans that were intended as the major resource of the classroom teacher to less structural materials and lesson plans that contain alternative suggestions to be used at the classroom teacher's discretion.

The Samoan system is moving toward more classroom teacher autonomy and greater participation at all levels by Samoan staff. U.S. contract TV teachers have been replaced by Samoan TV teachers. There are, presently, nine Samoan TV teachers. The television component is shifting its role from basic prescriptive instruction to one of the media components of a centrally planned, but flexible, instructional package.

Elsewhere in the World

El Salvador, Niger, and American Samoa are, of course, not the only countries of the developing world that are using technology to advance their educational goals. We have singled them out because, in their very different ways, they are the most prominent examples of the application of technology as a catalyst for integral reform of education in all its facets: teaching method, teacher preparation, teaching materials, curriculum revision, independent learning, and research and evaluation. As such, these three examples -- Salvador and Samoa comprehensive in scope, Niger still for all its unique promise a pilot project -- differ from all those educational applications of technology that are merely additive uses of this, that, or the other medium for enrichment and stimulation (or in some instances, to spread the reach of formal education) without very much improving its quality or effectiveness.

To help readers better assay the current state-of-the-art in educational technology, it might be useful to look briefly at three other examples -- two in Latin America, one in Asia. These by no means represent the total number of such programs around the world, but merely those about which sufficient information could be obtained. The programs differ greatly one from the other, as will be clear, even as the conditions and resources of the three countries differ. None uses technology as a catalyst for overall educational reform. Mexico, one of the most stable and prosperous of Latin American countries, has concentrated its experiment on extending secondary schooling to rural children who would normally not have access to such schools. Colombia's experiment, which has continued with some disruptions for the past 16 years, offers highly impressive programming, but -- like many such projects in the U.S. and other industrialized countries -- affects only a fraction of the student population and is not part of a program of basic change. Singapore is a very special case among "developing" countries, a small prospering city-state, whose concentrated geography and population are even more favorable to technology than El Salvador's.

By no coincidence, the technology in question is television -- a common denominator in Salvador, Samoa, and Niger as well. As noted elsewhere, this handbook has no reason for bias in favor of this particular medium, nor -- at this still primitive stage of educational technology -- for prejudging TV's paramount value. Simply going by what's happened so far, however, we must reach the tentative, pragmatic conclusion that the most impressive current uses of educational technology in the developing world, whether as part of integral school reform or to extend the reach of schooling or simply for enrichment, are those that use television.

Mexico

Like many other developing countries, Mexico suffers from an insufficient number of secondary schools. As more and more children graduate from primary school, a rising demand for secondary education has grown beyond what the government can readily provide.

Combining the concepts of a number of other ETV experiments, the Dirección General de Educación Audiovisual y Divulgación, a department of the Secretaria de Educación Pública, introduced Telesecundaria, an instructional television service for remote Mexican secondary schools. Telesecundaria began operations in January 1968, broadcasting to some 300 such schools.

The basic concept behind Telesecundaria is to provide junior high school education to students in villages that have no secondary school (7th-8th-9th grades). Like Niger the Mexican project utilizes the television monitor method. The overall program is based on local village cooperation; each village is required to provide a building, TV receiver and aerial, chairs, blackboard, and other classroom material.

When Telesecundaria was first publicly announced, 650 villages voiced a desire to participate. However, due to financial and other considerations, only 300 could be accepted. Programs began in January 1968 after an entire school year was spent evaluating courses via closed-circuit TV before they were broadcast over the air.

The courses of Telesecundaria are broadcast six hours each weekday morning and three hours on Saturday morning over Channel 5 in Mexico City and over XHAJ-TV, Channel 6, a repeater station in Las Lajas, Veracruz. All of the TV lessons are broadcast live.

A typical class consists of ten minutes of preparation before the TV session begins, twenty minutes of televised instruction, twenty minutes of follow-up in the classroom by the monitor, and ten minutes rest before the next lesson begins. The Telesecundaria curriculum is based upon the curriculum required for all secondary schools in Mexico. Courses include Spanish, mathematics, biology, geography, history, English, civics, music, technology, physical education physics, chemistry and vocational guidance. Formerly, special workbooks were produced by the Secretaria de Educación Pública, at a cost of 96 pesos (U.S. $7.68) per year, to support the TV lessons. But after evaluating the results of using special workbooks, in the future, beginning with the 1971-72 school year, the standard textbooks for all secondary schools in Mexico will be used by Telesecundaria students. Besides the official textbooks, the monitor and the students will be provided with special support materials in the form of pedagogical instructions for the better working of the TV lesson, short films, flannel board kits, still films, and specially prepared posters. All students (including children who watch the program at home) take standardized final examinations that are graded and evaluated by the Dirección General.

The future looks good for Telesecundaria and for the alleviation of the secondary school shortage in Mexico. At present all three grades are receiving the ETV programs. Furthermore, as Telesecundaria is being evaluated, it is allowing thousands of young Mexicans the opportunity to obtain a complete secondary education without ever entering a traditional school.

Colombia

Colombia's experience with ETV has been long and evolutionary. After two unsuccessful attempts to introduce instructional television (in 1955 and 1960), Colombia began an expanded program of ETV in 1963 to supplement classroom instruction in the primary grades (one through five) in the basic areas of language, mathematics, social science, and the natural sciences. Her ITV system is now one of the largest in the world, reaching about one-third of all primary students in the country.

Contemporary Colombia faces the same basic problems she faced when ETV was first introduced in Bogota -- problems similar to those of most other developing countries. Colombia is notable for the highest birth-rate in South America; at the present growth rate she will double her population every twenty-two years. Coupled with this crucial problem is a concurrent lack of trained teachers, educational funds, and materials. Furthermore, statistics released by the Education Division of the Colombian Department of National Planning in October 1970, indicate that only three out of each 100 rural school children who enter the primary schools complete five years (as compared with 44 out of 100 entering urban schools). Of each 1,000 primary school-age children (seven years old), 230 never attend schools; of those 770 children who do enter school, only 505 continue on to the second grade. After the first and second grades, there is a progressively large student attrition, so that eventually only about 216 of every 1,000 children finish five years of primary education.

The implementation of ETV in 1963 sought to change the primary school crisis by achieving the following overall goals:

1. To alleviate a shortage of funds for teachers and educational materials by

providing excellent teachers in the television classes and, at the same time, using educational materials in abundance within the programs.

2. To change the common practice of most teachers who base the entire learning method on rote memorization. It was and is hoped that teachers, in watching the ETV classes, would pick up some of the more modern and effective teaching techniques used by the teachers on television.

3. To alleviate a lack of trained teachers, particularly in the rural areas where teachers with as little as a fifth-grade education are employed. Hopefully, ETV would benefit such teachers directly, as well as the children they were teaching.

4. To maximize the holding power of the schools and cut down the overwhelming Colombian dropout rate.

With the help of AID and the U.S. Peace Corps -- who at one time supplied as many as 100 volunteers who trained technicians, producers, and television teachers -- Colombia ETV realized some of its goals; however, it still suffers the same old problems it has experienced since its original inception in 1955.

The Instituto Nacional de Radio y Television or INRAVISION is responsible for the production and distribution of ETV programs to 1,400 Colombian primary schools. Guides are distributed in advance to classroom teachers.

Program content is fairly traditional. Unlike El Salvador, Colombia's ETV goal is not to institute television as an integral part of the educational process, but to improve the quality of fairly traditional instruction through supplementary viewing.

The ETV section at INRAVISION is one of the best in the world in terms of technical ability and program production. Therefore, ETV in Colombia, unlike the case with most other such projects in developing countries, is no longer at the stage where its foremost needs are at the equipment or technical-engineering level; rather, its problems are older in nature and deal mainly with coverage and utilization of programs at receiving points and lack of an ongoing evaluation feedback mechanism.

There are only 1,500 ETV receivers in use in some 1,400 primary schools, most of which are urban. (This in a country with over 100,000 primary schools and nearly three million potential primary school pupils.) Many more receivers are needed if ETV in Colombia is to have a greater impact.

There is further need for reforms within the administrative structure and operational framework of the ETV system so that a closer working association can be achieved between the ETV effort and the other integral educational programs of the country. Excellent programming, such as that produced in Colombia, can be fully effective only if it is coordinated with the needs and activities of the students it is designed to serve.

Singapore

In Singapore, the "city-state of the East," educational television functions as an occasional aid to the classroom teacher. Programs, which initially in 1967 reached only secondary schools, are now designed for vocational, technical, and primary schools as well. About 95 percent of the secondary schools and the technical training institutes, and 78 percent of the primary schools now have at least one television set. The programs are produced by the Singapore Educational Television Service (ETV Singapura), a division of the Ministry of Education, and are broadcast via the television station of the Ministry of Culture. The entire budget is provided by the Singapore government.

Singapore does not have an absolute shortage of teachers. However, it does lack teachers with expertise in science, technology, and math; it lacks adequate materials to teach these subjects; and it lacks teachers who can cope with the extraordinary language demands of the typical Singapore classroom, a classroom that is composed of a mixture of individuals who may be conversant in only English, Chinese, or Tamil. The TV programming is designed to assist teachers in overcoming these problems.

An ETV Advisory Committee, composed of representatives from the Ministry of Education, the Teacher's Training College, the School Inspectorate, TV Singapura, and the schools, meets once a year to set specific priorities for television programming. A subject committee of specialists then decides in more detail how television can best contribute to the school curriculum. Scriptwriting is the responsibility of a selected teacher because the Singapore officials believe that a teacher knows best how a subject should be taught, being particularly aware of classroom problems -- especially pacing -- which are most likely to occur. The subject committee reviews a few of the programs in the series; then several are tested on students, and once revised, the series is finally completed. Further revisions occur at yearly intervals. Programs are produced on a shoestring budget; a single program may cost as little as $50.00 with the most expensive costing $300.00.

Teachers receive a brief training course at the beginning of the year; all receive audio-visual courses in teacher-training school. Any single class receives an average of three televised lessons per week, each lesson running approximately twenty minutes, leaving 10-15 minutes each for introduction and follow-up. Teacher's notes, provided well in advance of the broadcast, give a lesson synopsis as well as suggestions for additional classroom activities.

Feedback on the quality of programs and their classroom usefulness is obtained via two mechanisms: a team from the school inspectorate visits the schools once a term, and a weekly questionnaire is sent to a random thirty teachers.

While there have been no specific studies to quantify the effects of the Singapore television lessons on student achievement, it would appear by the response from students teachers, and administrators that the program has been generally successful.

V

V. Educational Costs: Some Comments

Ten to fifteen years from now educational planners may expect studies comparing the costs of educational systems in various countries, comparative figures on the different forms of technology or different educational components within a single country's educational system, and reports showing the comparative effectiveness of various educational systems or components. Today, however, few studies provide definitive information on the cost or cost benefit of any form of educational technology.

Unfortunately, cost benefit is seldom a prime consideration in the design of educational technology systems. The result is that policy makers and planners have few cost comparisons to guide them in designing and incorporating educational technology into education systems.

What do decision makers know about educational technology costs and how they relate to individual educational systems? For the most part, they realize that:

- Until now, at least, the costs of educational technology have generally been "added-on" to the normal educational expenditures of school systems in all countries;
- Educational technology costs are not listed separately in the records of most educational systems; data on such costs are not extracted from the accounts, analyzed in detail, or compared with other specially assembled data;
- So far, at least, no educational system has produced adequate measures of cost effectiveness; there are no examples of cost effectiveness that can be replicated in a significant number of similar countries.

- Each of the developing countries now operating major comprehensive educational television experiments expects that (a) the cost per student will drop as the number of students taking instruction by television increases; (b) the quality of instruction will increase; and (c) the number of students repeating grades because of past failures will decrease.

As of now, no one has even determined the real costs of educational technology. For example, the cost per student of an educational television system will vary in direct proportion to the scale of production, quality of transmission facilities, and the sophistication of the programming; the cost will vary inversely in proportion to the number of students using that system.

The significance of cost differences in any system using television or other media must be measured, moreover, against the cost of alternatives that are presently or might soon be available to a given country. In most parts of the world, merely continuing the present educational system -- without expanding the number of students enrolled -- will obviously cost more each year as a result of increased salaries for teachers, and additional expenditures for equipment, services, and other items affected by world-wide inflation. In fact, many countries believe that expanding the present educational system along conventional lines -- including training and employing more teachers and increasing the number of schools and materials -- costs far more than they can afford to spend.

Above the mounting cost of expanding an educational system, many countries find themselves incapable of allocating an increased proportion of their educated population to the teaching profession. For example, a few years ago Colombia studied the relationship between educational television and the country's ability to supply teachers to growing numbers of school children.

Planners found that if television were used in the schools, the country would be able to provide the additional teachers required to implement the system; without television, they would not be capable of supplying enough teachers to meet the demand of increased enrollment. Because the lack of a sufficient number of qualified teachers was one of Colombia's most pressing problems, the economics of the situation combined with the lack of manpower to make educational television a most attractive alternative.

A general principle, therefore, is that an educational media system using television or radio has the distinct potential to increase the number of students who can benefit from high quality educational programming in countries where highly trained manpower is in short supply. By utilizing educational technology, it may also be possible to amend the educational quantity and provide a better quality of educational instruction at a price a developing country can afford. This may be even more feasible if outside funds can be obtained for capital investment or new construction.

El Salvador

El Salvador provides an example of the overall impact of educational technology on an educational system. The number of junior-high-school students participating in the Salvadoran instructional television experiment will grow from 2,000 in 1969 to an anticipated 40,000 in 1972. Cost per student will drop from $150 to $16 per student as shown on the following table:

Comparison of Educational Cost in El Salvador
(In Dollars)

Item	1969	1970	1971	1972 Estimated	Total
1. Cost of television programs in junior high schools					
A. Cost of ITV programming	$292,000	$344,000	$388,000	$396,000	$1,420,000
B. Capital costs - (annual amortization)					
Transmission facilities	32,800	32,800	32,800	208,000	306,400
Receiving sets	2,800	10,800	10,800	30,800	55,200
C. Total cost per year	$327,600	$387,600	$431,600	$634,800	$1,781,600
2. Number of students in tele-classes each year	2,000	10,000	25,000	40,000	*
3. Cost per student per year of television education	$ 150.00	$ 38.80	$ 14.40	$ 16.00	*
4. Average total cost per year of educating a junior high school student	$ 92.40	$ 96.00	$ 101.20	$ 104.00	*
5. Percentage cost of television education is of total junior high school education cost	*	*	14.2%	15.4%	*

* Not comparable, inasmuch as only a small proportion of junior high school students were involved in the first few years of the program.

Note: The estimates in this table assume that television programs have a useful life of three years: that the transmission facilities should be amortized over a 10-year period and the television sets over a five-year period. Dollar amounts are calculated on the assumption that 2½ colones = 1 dollar.

By 1973, if all of the 60,000 students enrolled in the junior-high schools are included in the instructional television system, the annual unit cost will drop possibly by another 30 percent.

The table further shows that program costs -- over a period of years -- are the largest part of the total expenditure (see first line of figures in the table); the annual amortization cost of the television transmission equipment is a lesser cost (see second line of figures); and the amortization of the cost of the television sets themselves is relatively small (see third line of figures). Moreover, if a country can provide a moderate amount of additional programming for adult education or to operate schools in double shifts to handle more children, the cost per unit would be substantially decreased.

The Salvadoran television project has undergone more intensive cost analysis than any other country's instructional technology program. The investigating economist found that the average yearly cost of educating a junior-high-school student amounted to $101 in 1971 and is expected to increase to only $104 in 1972. Television expenditure (which was $14 per student in 1971 and estimated at $16 for 1972) amounted to only a 15 percent "add-on" to the regular annual cost. This points to a fact which many educators usually avoid; that is, until instructional television encourages a substantial increase in the number of students per teacher, the cost of ETV will always be an "add-on" item.

Because research has often shown that television can inspire learning just as effectively as a teacher, educational planners asked the economist studying the Salvadoran project: At what point could instructional television do an assigned job as economically as a teacher? After lengthy analysis, the answer given: Including amortization of equipment and sets, the cost of instruction using television in El Salvador is equal to the cost of ordinary classroom instruction for a "critical mass" audience of about 25,000 viewers per program annually at the junior-high-school level, and at about 50,000 viewers per program annually in the less-costly primary-school grades.

El Salvador already has a large school audience. Therefore, there is potential for a significant savings through ETV. For example, the economist calculates that in the first grade -- where enrollment in 1971 was about 170,000 students -- instructional television could deliver one hour of instruction at a cost of about 20 cents per class (including all amortization costs) compared to a cost of $1 for one hour of instruction by a teacher. This is a real option which El Salvador may well consider during the next few years.

Ivory Coast

Another way to reduce the cost of instruction is to reduce the rate of failure and the number of repeaters in each grade by using television to improve the instructional program. The overall cost of sending each student through a school system is thereby reduced. Such is the purpose of a project now underway in the Ivory Coast where planners hope that instructional television will be so effective that the number of repeaters will be reduced by 95 percent and the number of elementary school graduates increased by 105 percent. The cost per student of those completing six grades is thus expected to drop by 40 percent -- from $675 per student under the old system to $400 under the new system (including all television costs).

The key to the anticipated decrease in cost in the Ivory Coast lies in the assumption that a better educational system -- including better teachers, curriculum, and materials -- will dramatically decrease the number of repeaters. Under the present system, the average Ivory Coast elementary school graduate repeated grades and therefore spent parts of about 16.5 years in primary school. Under the new system he will spend only 5.6 years. The improved system will therefore be both more efficient and more economical.

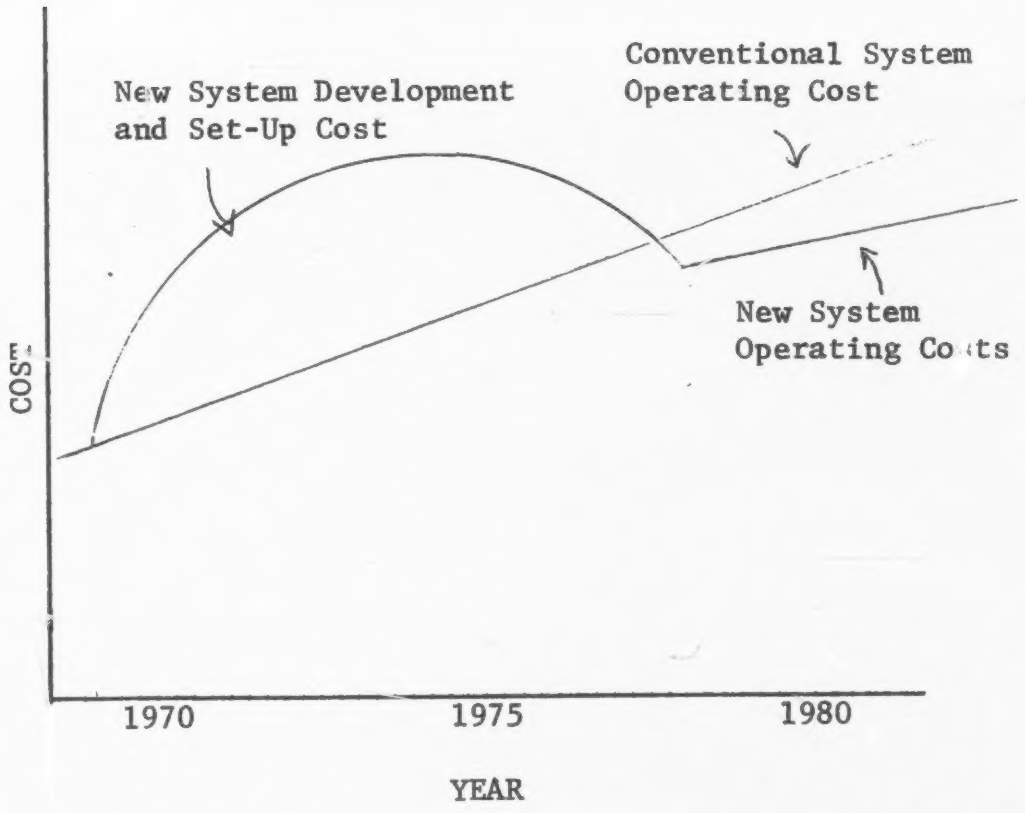
Niger

A similar analysis of the cost of expanding Niger's television pilot project into a full-scale program indicates that the traditional system would graduate 10,730 students (about 1/20 of those who would enroll) at a cost of $798 per graduate, whereas under the ETV system, 105,000 graduates (about 1/17 of those who would enroll) would cost $428 per graduate.

Korea

The Republic of Korea is also initiating a reform of its primary and middle school system (grades one through nine) in a pilot project using both educational television and radio. The aim of the new program is to yield a higher quality education with lower recurring operational unit costs than the present system. A time projection of the expected cost saving follows:

EDUCATIONAL COST COMPARISON IN KOREA



Source: An Educational Sector Analysis for the Republic of Korea, by Robert M. Morgan and Cliffon B. Chadwick, editors. Final report to the U. S. Agency for International Development under contract with Florida State University, April 1971.

The Korean pilot project will be installed in a community of about 100,000 students. Once established and successfully tested, the system will be expanded to other areas of the country.

The Korean project will utilize teaching teams -- consisting of one master teacher, one associate teacher and two teacher's aides -- and each team will be responsible for about 300 students. The salaries for both the master teacher and the associate teacher will be substantially higher than current levels. This arrangement will increase the student-teacher ratio from 55 to 1 to 75 to 1, and -- at the same time -- will permit a substantial cost saving. In addition, double-shifts in the schools are planned to make more room for more students on a more efficient basis.

* * *

Final note: In addition to the difficulty of securing reliable cost data, there is a problem in any cost-benefit analysis of instructional technology that seems to be inherent to all educational analysis; that is, the great difficulty of pinpointing the exact cause of any educational outcome. It is frequently possible to prove that a system using television or radio yields better results at reasonable costs (more students through the system, better scores on standardized tests), but, by itself, this does not prove that the television or radio component is responsible for these improvements. Instead, the analysis only shows that the system as a whole is a better one.

VI

VI. Looking Ahead

(1) Research and Development

The planning, design, and operation of an educational system using technology is an experiment -- an experiment in the improvement and extension of learning to meet the pressing needs of today's world.

It is at the same time an enquiry into the very nature of the learning process. For there is a growing awareness that our ability to improve education has been seriously impeded by our lack of precise knowledge of how people learn.

In a message to the U. S. Congress early in 1970, President Nixon called for re-examination of programs for educational reform and urged new emphasis on research and experimentation to help unlock "the mystery of the learning process." This, too, was the central emphasis in the report of a national Commission on Instructional Technology which the President sent to Congress in January 1970. These words underscore the need for fresh approaches, not to any one aspect or component of education, but to the entire system, centered on the learning of each individual student. In a sense then, any new media system is part of a research and development scheme in the worldwide search for better ways to instruct and to learn.

Research and development are integral to modern advances in science, technology, and industry, so much so that "R & D" sometimes is invoked as if it were a magic formula or incantation. To date, education has largely failed to emulate these other sectors of society in putting R & D to work. But any country or community undertaking educational change through technology should make sure to build provisions for research and development into its program.

Ideally, the spirit of research should permeate any new media system -- a kind of research-in-action that enables schools, colleges, teachers to reach better solutions to pressing problems, and to develop them in ways that the initial blueprint may not have contemplated.

What this means, in practice, is acceptance of the fact that any program -- however carefully planned and weighed against other alternatives -- must always be considered as a developing one. If it has been decided, for instance, to institute a multi-media system, surprises -- even setbacks -- should be anticipated and from the start ways of modifying the system should be built in to reflect changing conditions and feedback results.

It means, too, that there are no hard and fast rules that a new learning system must follow. Should there be five or 35 children in a classroom? Can teacher aides or monitors be used instead of teachers? Why teach medieval English history to African school children? These questions must be answered with an open mind, a willingness to experiment, and a sensitivity to local conditions and the attitudes of classroom teachers.

Niger and El Salvador take different approaches to the problem of research and development. It is easy to recognize Niger as an experiment for it was so designed. As such, all the components of the program breach tradition: the use of monitors instead of teachers, the use of television as the main medium of instruction, the new curriculum. The Niger program is now reaching the end of its experimental phase and, because initial plans did not provide for expansion, the project faces a critical struggle for survival. However, the

Nigerienne research into learning through television and the program's development have greatly influenced plans for a much larger experiment: the proposed ETV project in the Ivory Coast.

Unlike Niger, El Salvador did not undertake its educational reform as a pilot; research and development have been incorporated in the system from the start. The Salvadoran procedure makes clear that good results depend upon good evaluation. Detailed questionnaires sent to teachers and students; frequent tests; and reports by supervisors form the data base for evaluation reports that keep track of the effects of new teaching methods on the attainment of learning objectives and help in making appropriate changes.

(2) In the Future

As this book has emphasized throughout, educational technology is still in a primitive state everywhere in the world. Its history to date has been marked with false starts, inflated expectations, and assorted misunderstandings about its potential and the requisites to its success. The development of hardware has far outstripped that of software, and in all but a few places the media have been tacked on piecemeal to outmoded systems. Far too often what has been touted as an exciting and productive experiment turns out to be what a well-traveled British expert calls another "going-to": a project initiated with enthusiasm and drive that its sponsors claim is going to accomplish great educational changes if it proves out, if there's money enough, if it is blessed by favoring political and pedagogical winds.

There are enough of these cautionary examples in countries at every stage of development to warrant the most careful and sober consideration of technology's potential for any given educational system. Authorities who are weighing the introduction of educational technology can learn from the mistakes of their precursors. Indeed, whatever wisdom this handbook has been able to distill and convey derives in good part from studying past and present misconceptions of technology's role in education and from analyzing different approaches that have produced -- or give every promise of producing -- solid changes that improve learning and benefit society.

Many changes in educational technology and its applications can be expected within the next decade or two. The range and variety is vast; the implications for education are enormous. In the field of hardware, experts predict relatively simple things like low-cost transistorized TV sets and inexpensive 8 mm movie cameras and projectors that even a small child can operate. There will also be potentially powerful educational tools such as electronic video recorders (that convert ordinary TV receivers into multi-purpose educational machines and interactive computer consoles). The use of communication satellites in education is expected in the next few years.

The realization of technology's full potential for education belongs to the future, to be sure. But it is not the blue-sky, science-fiction future, nor a magical overnight solution to education's problems. Rather, it is a future that could transform education, not through wishful hopes and dreams, but through the logical fulfillment of long-range, well-laid, thorough systematic planning.

If this manual has a single message, it is that today is none too soon, and tomorrow may be too late, to begin the long process of planning for a new educational system to be fully inaugurated five or ten years hence. The preceding chapters have spelled out the elements that must go into effective planning:

> Realistic assessment of the present system;
>
> Thoroughgoing comparison of the accepted goals of education with the goals really consonant with present-day conditions and the most desirable prospects of man and society;
>
> Determining priorities among agreed-on objectives;
>
> Finding out what resources, internal and external, are available;
>
> Top-level organization and commitment;
>
> Practical arrangements that will encourage optimum use of technology in the classroom;
>
> Teacher training;
>
> Machinery maintenance;
>
> Production of superior program materials in great variety;
>
> Provisions for building R&D (especially evaluation) into the project from the very start of planning;
>
> Trial in a real but controllable situation, and provision for modification based on trial results.

Today's plans need not preclude technological marvels yet untried or still largely experimental.

Planners can have vision without being "visionary." Indeed, plans must be flexible and open-ended enough to embrace new developments as they materialize.

Some educational projects use -- or propose to use -- existing technologies in new and innovative ways, e.g., in Great Britain and the Ivory Coast. Others, such as those proposed in India and Brazil, make use of totally new forms of transmission.

The Open University

Adult education classes taught through TV and radio instruction and correspondence packets are commonplace, usually as low-ranking appendages of traditional institutions of higher education. However, Great Britain has pioneered the integration of all these techniques into one program, which offers all adults a chance for a university education, whether or not they possess the traditional academic qualifications.

The Open University began operation in January 1971 offering four foundation courses leading to degrees -- in social sciences, the humanities, mathematics, and science. Opening enrollment was about 25,000 chosen from among 43,000 applications on a first-come, first-serve basis, although they did attempt -- without consideration of academic credentials -- to divide students among the four major fields of study, by geographical location and type of employment. The first-year students are predominantly middle class (about 33 percent are teachers).

The central campus of the Open University is a 70-acre site 50 miles north of London, where a full-time faculty and administrative staff construct courses, produce and distribute print and nonprint correspondence materials, and maintain student records. There are 250 regional study centers across the country where students can watch TV programs and meet with tutors (a corps of 2,500 part-time professionals holding academic posts at nearby educational institutions). It is hoped that this kind of tutelage will help combat the high dropout rate usually associated with correspondence teaching.

During the week the British Broadcasting Corporation broadcasts four hours of radio and television -- one hour for each of the 1971 courses. The programs attempt to bring the student at home closer to reality than possible through the use of printed descriptions (e.g., the TV science courses bring the laboratory to the student). He is able to witness close up views of sophisticated equipment that most students would probably never see.

The British government finances the university through a grant from the Department of Education and Science. Establishment of the program cost an estimated $10 million and will operate on a yearly budget of about $19 million. Economies of scale will keep the Open University's per pupil costs at about half those of traditional British universities.

One real problem the Open University faces is the stigma often associated with correspondence study and after-hours instruction. Another key problem facing the university is the difficulty of creating a good working partnership between the academics of the Open University and the BBC production staff.

At the base of this problem of equal partnership are the real doubts in the minds of all engaged in the Open University as to the role of radio and television in higher education. On one level there is a straightforward answer -- without the technology of broadcasting the Open University could not do the job it is setting out to do. Provision of high quality education to large numbers of students distributed unevenly all across the nation requires some use of a mass distribution system like television. But on a deeper conceptual level, the function of broadcasting in university courses becomes more difficult to identify if one accepts that the technology should be used to do more than just transmit university lectures.

Ivory Coast

In late March 1970, representatives of the Ivory Coast, France, and three United Nations agencies -- the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Development Programme (UNDP), and the United Nations Children's Fund (UNICEF) -- formally agreed to collaborate on a ten-year $50 million project to establish a nationwide system of classroom television in the Ivory Coast. The project will involve equipping primary schools for a million Ivorian children with TV sets (to be provided by France) and for the development of curricula built around their use. Projected costs anticipate a reduced per pupil expenditure (see Resources).

The world's most ambitious educational TV project to date, the plan calls for putting a television receiver in every grade school classroom in the country by the year 1980 and doing most teaching through an elaborate ETV system. When in full operation, the new educational program is expected to more than double the number of children in primary and secondary schools in the country; and is expected to demonstrate that instructional television can reduce the percentage of school dropouts and grade repeaters when used on a national scale in an underdeveloped country.

For more than four years UNESCO has been assisting the Ivory Coast in planning the project. France will provide the necessary technical experts; the World Bank is expected to provide about $2 million for the construction of a number of buildings including a training college for classroom teachers who will supplement the instructional television programs. One unique aspect of the program is that the teachers will enjoy both pre- and in-service training as the experiment progresses.

The first experimental telecasts began in October 1970; by October 1971, televised classes will be offered to first graders in 600 schools. Many of the sets will be battery operated because they will be used in communities which lack electricity. Ultimately, instruction is to be provided for all pupils in the first four grades.

The use of television is being concentrated in the early grades because UNESCO and French technical experts believe that (a) young children are very receptive to televised teaching, and (b) that in underdeveloped countries the teaching of young children is generally done inefficiently but at great expense.

Ivory Coast ETV, which in the past has been grossly under-used, will become an essential part of the Ivorian national educational system. Its progress and experience will have far-reaching implications for other developing countries.

Communications Satellites

The most spectacular technology in the offing is, of course, the communications satellite. However, just as with television (or radio) transmitted through other modes, satellite television is neither better nor worse than the quality of that which is transmitted. This is a frequently ignored tenet of broadcasting that must be continually repeated. The successful educational use of satellites will inevitably depend on the contents of programs aired, quality of teaching, methods of use, indeed all the system components identified in Chapter II.

Until recently satellite technology has been used almost exclusively to entertain or enlighten audiences in the affluent areas of the world. Recent studies, however, suggest that communications satellites could, for large-scale applications, be the most effective way of overcoming inadequate educational and communications systems and providing high-quality education to people in some underdeveloped parts of the world.

A satellite offers a large country (or group of countries) lacking adequate ground communications a system that can cover a geographic area of a million or more square kilometers. It can broadcast to an entire region or beam its presentations selectively to specific areas for particular users. Unobstructed by mountains, rivers, and other geographical barriers, it offers easy access to regions that would be extremely difficult or very expensive to reach by ground systems. Furthermore, satellites can meet all kinds of needs besides those of education. Besides radio and television, space technology can transmit communications of other kinds: telephone, telegraph, data facsimile, etc.

This discussion does not intend to imply that the utilization of communications satellites for educational purposes would be inexpensive. The reverse is true. All studies indicate that the costs of operating such a system would be substantial -- so much that it could only be utilized effectively on a very large scale, where the cost of transmission hardware is a relatively small part of the overall system budget. In short, the satellite would only be cost-effective for the very situation for which it is most indicated --

for use in a large geographic area, densely populated, with little or no existing infrastructure.

No use of satellite technology to alleviate problems of the developing nations has been attempted to date. However, many countries are keenly interested in the possibilities; some are working on prospects with various international and national organizations. A 1967 UNESCO and U.S. mission to India has been followed by other missions to Brazil, Pakistan, and a group of South American countries.

To date India and Brazil are furthest advanced in plans to use space technology for formal and nonformal educational development. Other countries that have expressed an interest include Mexico, Indonesia, and several African nations.

The proposed Indian experiment, scheduled to begin around 1974 or 1975, could dramatically prove the practical value of broadcasting to vast and remote areas with little or no existing communications infrastructure. Under an agreement between the U.S. National Aeronautics and Space Administration and India's Department of Atomic Energy (DAE), India will borrow NASA's expected ATS-F earth satellite to beam instructional television directly to some 2,500 Indian villages. The experiment will be the first ever to broadcast television programs from a satellite directly into small, inexpensive, specially augumented community receivers. In addition, larger Indian cities will receive the signals through large receivers and transmit them to their surrounding populations. As currently planned, program content, for which India will assume complete responsibility, will primarily emphasize family planning, agricultural development, hygiene, and rudimentary elementary school subjects.

If the one-year NASA experiment proves successful, India hopes to establish a domestic satellite communications system of her own (hopefully to be both built and launched by the Indian DAE). Under long-term Indian planning the satellite would reach 560,000 villages and 84 percent of her population by the year 1985.

Though its planning is one to two years behind that of India, Brazil is actively investigating satellite possibilities and will be sending observers to India to gain firsthand knowledge. Unlike India, Brazil is chiefly interested in using the ATS-F (or G) to spur a massive program designed to upgrade teachers and students in schools throughout the entire country. Brazil is now engaged in a large-scale educational research-and-development project exploring the possibility of establishing a nationwide in-school educational technology system. If a proposed NASA/Brazilian experiment materializes and is successful, Brazil might later launch its own satellite designed to supply as many as 150,000 schools with 200 audio channels and three television channels. The capital cost of the project will be $350 million, and the operating cost will be $100 million a year, mainly for software.

Both the Indian and Brazilian projects could serve as models for other developing nations or groups of nations, and should answer many questions as to the role space technology might play in the development and the progress of the third world.

* * *

The communications satellite, in all its costly glamour and immense versatility, dramatizes an essential, basic fact about the development process which cannot be stressed too often and which we hope this handbook will help to document. Just as educational technology must be integrated into overall educational reform to be fully effective, so educational planning to be successful must be part of a wider national planning system.

The returns now in, from research studies as well as simple observation, provide overwhelming evidence of the baleful influence on educational achievement of poor housing, bad nutrition, impoverished environment in the early years of a child's life. (The evidence comes from countries at all stages of development.) In the same way there is now general recognition that unless a country's education policy and her economic and manpower policies are closely coordinated, both "educated" and "uneducated" people will end up unemployed or underemployed, and in any event frustrated and unproductive.

Systematic planning for education -- a new media-based system, for instance -- must proceed in tandem with systematic planning for housing and employment, for roads and communications, for industry, farming, and trade. Technology can be a potent part of education, as education is an essential part of the whole society.

A

APPENDIX A: Sources of Information and Assistance on Educational Technology

This Appendix lists some of the organizations, large and small, national and international, that can, in some way, be of help to those considering new educational media projects.

While we have made an effort to make the entries as diverse as possible, these lists are heavily weighted with U.S. sources. They are in no way exhaustive. We would appreciate any additions the reader will suggest to help fill in gaps and update the lists.

The Appendix has five sections:

(1) General Information, Technical and Training Assistance

(2) Software Information and Sources

(3) Hardware Information

(4) Professional and Trade Associations

(5) Financial Assistance: Sources and Information

A. (1) Sources of General Information, Technical, and Training Assistance

Below is a listing of international organizations and agencies which should provide useful information concerning various aspects of educational reform projects -- particularly those involving technology -- in developing countries. Some are world-wide in scope. Others concentrate activities within their own regions. Many maintain facilities to train people of developing countries in the new kinds of educational and technical jobs required for successful operation of educational media projects.

Some primarily operate or aid local media projects. They have valuable information for planners and educators who wish to know details on how specific media projects were organized and how they are progressing.

ADVANCED COMMUNICATION TECHNIQUES SEMINARS (1114 Post Rd., Riverside, Connecticut 06878) provides "hands on" workshops on television and video tape for training and communication covering organization, objectives, scripting, graphics, lighting, audio, production, editing, distribution, and maintenance.

AMERICAN COUNCIL OF VOLUNTARY AGENCIES FOR FOREIGN SERVICE, INC. (200 Park Ave., South, New York, N.Y. 10003), through its consulting, coordinating, and planning services, encourages maximum effective use of American contributions for overseas assistance. Its Technical Assistance Information Clearinghouse makes available current information about development assistance with particular reference to the resources and concerns of the private voluntary nonprofit sector.

ASIAN BROADCASTING UNION, ABU (Secretary-General: GPO 3636, Sydney 2001, Australia; Headquarters: NHK Bldg., 2-3, Uchisaiwai-Cho, 2-chome, Chiyoda-ku, Tokyo, 100

Japan) assists development of member radio and TV services by organizing several film exchanges and an annual radio festival of folk music; assists staff training through courses provided by individual members and outside organizations; researches and sponsors joint production of educational films for schools about countries of the ABU region. Its TV series, "Neighbors," with English narration, may be bought by non-members.

ASSOCIACION INTERAMERICANA DE RADIODIFUSION, AIR (Apartado Postal 720, Edificio Palomo, San Salvador, El Salvador) is a regional broadcasters' organization.

ASSOCIATION FOR PROFESSIONAL BROADCASTING EDUCATION (1771 N St., N.W., Washington, D.C. 20036) issues annual register of degree-granting universities and colleges which give courses in radio and TV, aids junior and community colleges in curricula for broadcast technicians, publishes quarterly Journal of Broadcasting.

BRITISH COUNCIL (65 Davis Street, London W1, England), with local offices in many countries, distributes films and other aids, offers the assistance of specialists in the area of English language teaching by television, and helps production people from developing countries find training assignments with various institutions in the United Kingdom.

CENTRE FOR EDUCATIONAL DEVELOPMENT OVERSEAS, CEDO (Tavistock House South, Tavistock Square, London, WC1H 9LG) was recently established as an independent entity by the British Ministry of Overseas Development "to promote by all means possible, the development overseas of education." Three former organizations form the nucleus of this new Centre: The Centre for Educational Television Overseas (CETO), the Centre for Curriculum Renewal and Educational Development Overseas (CREDO), and the

Overseas Visual Aids Centre (OVAC). The Centre will sponsor, initiate, and evaluate projects concerned with educational aids for developing countries. Training courses, publications, and feasibility studies are integral parts of the program.

CENTRO DE ESTUDIOS EDUCATIVOS, A.C., CEE, Educational Research Centre (Culiacán 108-4^{o}, Mexico 11, D.F.) is a private, nonprofit institution, dedicated to educational research in Latin America, particularly Mexico. CEE has a news service which classifies, examines, and comments on all news concerning education in Mexico; it provides information on Latin American educational matters and maintains contact with important Latin American educational clearinghouse and documentation centers.

CENTRO NACIONAL DE INVESTIGACIONES EDUCATIVAS, Ministerio de Cultura y Educacion (Av. Las Heras 2545, 2^{o} Piso, Buenos Aires, Argentina) through its Department of Technology, produces such learning aids as slides, records, films for screen and TV; reviews world-wide research; issues publications; maintains an audiovisual information library; helps schools set up audiovisual departments; sponsors teacher-training courses around the country. This agency also produces educational radio programs; it will soon begin educational broadcasts to primary and secondary schools, and to the community. It will also serve as one of the four regional training centers of the Organization of American States.

COMMONWEALTH BROADCASTING CONFERENCE (Broadcasting House, London W1, England) consists of 19 national commissions and corporations responsible for radio and television in their nations.

COMMITTEE FOR THE FULL DEVELOPMENT OF ITFS FIXED SERVICE (c/o Federal Communications Commission, 12th & Pennsylvania Avenue, N.W., Washington, D. C. 20554). Aids development of 2500 Mz bands for instruction.

COMMUNICATIONS SATELLITE CORPORATION, COMSAT (950 L'Enfant Plaza South, S.W., Washington, D.C. 20024) operates a world-wide system of commercial communications satellites in cooperation with more than 70 countries which comprise the International Telecommunications Satellite Consortium (INTELSAT). The satellites in the global system relay many forms of communications between earth stations in a growing number of countries around the world.

EDUCATIONAL MASS MEDIA CENTRE (P.O. Box 3025, Addis Ababa, Ethiopia) produces television and radio programs and audiovisual materials for schools, for adult education, and for teacher training. Training courses in TV program production are also offered.

EDUCATIONAL MEDIA COUNCIL, INC., EMC (1346 Connecticut Ave., N.W., Washington, D.C. 20036) serves as a forum for its 15 national nonprofit member organizations concerned with educational media. Publishes annual directory of summer courses on instructional technology at universities and colleges in the U.S. Can provide information about its member associations which educators in developing countries may wish to consider joining.

ERIC at Stanford (located in the Institute for Communication Research, Stanford University, Stanford, California 94305) is a clearinghouse on educational media and technology. It is one part of the U.S. Office of Education's 19 regional Educational Resources Information Center network. Maintains a departmentalized collection of research information obtained from the United States and abroad. Publishes a newsletter, bulletins, and interpretive studies. Documents may be ordered in microfiche or hard copy form.

EUROPEAN BROADCASTING UNION, EBU (1, rue de Varembe, CH-1211 Geneva 20, Switzerland) supports the interests of 86 members in 63 countries and generally assists the world-wide development of radio and television. The member organizations of the EBU, with the assistance of its permanent staff, share their knowledge and experience with others by sponsoring conferences, some of which have dealt with educational radio and television. Broadcasting organizations from countries outside the European broadcasting area are admitted as associate members.

INFORMATION CENTER ON INSTRUCTIONAL TECHNOLOGY (Academy for Educational Development, 1424 Sixteenth Street, N.W., Washington, D. C. 20036), sponsored by the U. S. Agency for International Development, provides a variety of information resources on the use of instructional technology in developing countries. The collection includes films, filmstrips, and radio and television tapes, as well as books, reports and other documents. The Center expects to create an international clearinghouse for exchange of information and materials on educational technology. Visitors and requests for information are invited.

INNOTECH CENTER, SEAMEO Regional Centre for Educational Innovation and Technology (39 Newton Road, Singapore 11) was organized by the Southeast Asian Ministers of Education Organization. The goal of this fledgling organization is to assist its seven member states in the identification and resolution of their basic educational problems and to undertake training programs, research and experimentation, publications, and other kindred activities throughout the region. The name INNOTECH is an acronym for "innovation" and "technology."

INSTITUTO CENTROAMERICANO DE EXTENSION DE LA CULTURA, ICECU (Ciudad Universitaria, Rodrigo Facio, P.O. Box 2948, San Pedro, Costa Rica) uses radio, and, to a limited extent, television, to spread general cultural and educational opportunities to adolescents and adults of all social levels, especially those who have had little or no chance to benefit from the regular educational system.

INSTITUTE OF ADULT EDUCATION (The University College, P. O. Box 20679, Dar es Salaam, Tanzania) trains adult education teaching staff; offers adult education courses to meet urban needs; does research and evaluation of new education programs; helps organize radio study groups by training leaders, preparing programs and developing study guides; administers a pilot project aimed at the establishment of a National Correspondence College to serve isolated persons throughout the country.

INSTRUCTIONAL TELEVISION CENTRE (14 Klausner St., Ramat Aviv, Israel) is part of the Israeli Ministry of Education and Culture. Has been discussing a center to train ETV personnel, with possible application to students from developing countries. Write the Director General.

INTERAMERICAN BROADCASTERS ASSOCIATION (1031 esc 2. Montevideo, Uruguay, R.O.V.) represents broadcasting interests of official and private, national and international organizations; sponsors continental or regional conferences of a technical and educational nature. It maintains standing committees on ethical, legal, technical, and publicity problems. A general assembly is held every two years; the board of directors meets twice a year.

INTERNATIONAL BROADCAST INSTITUTE, IBI (Tavistock House East, Woburn Walk, Tavistock Square, London, WC1H 9LG Great Britain) undertakes research and analysis and prepares policy recommendations on international communications. Institute members from 45 countries approach communications problems from the perspective of the general public's good.

INTERNATIONAL COUNCIL FOR EDUCATIONAL DEVELOPMENT, ICED (522 Fifth Avenue, New York, N. Y. 10036) combines two former organizations: Education and World Affairs and the Center for Educational Enquiry. ICED is concerned with the international programs of American higher educational institutions and with strategies for overseas educational development. It is also interested in the modernization of the university and the management of systems of higher education.

INTERNATIONAL COMMUNICATIONS MEDIA STAFF (U. S. Information Agency, 1776 Pennsylvania Avenue, N.W., Washington, D. C. 20547) helps interested parties (1) obtain certificates for exporting software abroad and/or (2) authenticate foreign certificates for duty-free entry of audio-visual materials into the United States.

INTERNATIONAL FILM AND TELEVISION COUNCIL, IFTC (Via Santa Susanna 17, Rome, Italy) created in 1958 under the auspices of UNESCO, is an international, non-governmental, independent, nonprofit organization, open to representative international federations or associations whose work lies in the area of film and television. IFTC also admits, as associate members, national bodies whose activities in film and television are of recognized international significance. It arranges conferences, congresses, festivals, and meetings on all aspects of film and television including education. The IFTC publishes various directories concerned with films and television.

INTERNATIONAL INSTITUTE FOR EDUCATIONAL PLANNING, IIEP (7 rue Eugene-Delacroix, 75 Paris-16^{e}, France) was established by UNESCO to serve as an international center for advanced training and research in the field of educational planning. The Institute's aim is to expand knowledge and increase the supply of competent experts in educational planning, thereby helping accelerate educational development. It cooperates with interested training and research organizations throughout the world.

INTERNATIONALES ZENTRALINSTITUT FUR DAS JUGEND - UND BILDUNGSFERNSEHEN (8 Munchen 2, Fundfunkplatz, 1 Germany) is a documentation and information center for the promotion of educational television services. It collects, compiles, and evaluates information and documents on the theory and practice of television programming -- for general education, for culture, for school, for vocational and professional training, and for the university. The Center publishes in English, German, French, Spanish, and Russian.

JAPAN AUDIO-VISUAL INFORMATION CENTRE FOR INTERNATIONAL SERVICE (26, Nishikubo Sakuragawa-cho, Minato-ku, Tokyo, Japan) communicates with some seventy countries, collecting and disseminating the latest information on audiovisual education. Publications issued include "Audio-Visual Education in Japan," a series which lists software and hardware produced in that country.

NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS, NAEB (1346 Connecticut Avenue, N.W., Washington, D.C. 20036) provides consultant services, feasibility studies, and technical assistance for international educational broadcasting (radio and television) projects through its Office of Research and Development; maintains an extensive library of broadcasting resource materials; sponsors educational broadcasting institutes; produces radio and television programs.

NATIONAL EDUCATION ASSOCIATION, NEA (1201 Sixteenth Street, N.W., Washington, D.C. 20036) through its Division of Educational Technology provides consultative services on planning, writing, and producing motion pictures and other kinds of visual communication media. The Association is a producer of motion-picture filmstrips and other audiovisual media dealing with aspects of education.

RADIO NEDERLAND TRAINING CENTRE (P.O. Box 222, Hilversum, The Netherlands) with the help of the Netherland government's technical assistance program, Philips Electrical Industries, and a number of Dutch institutes of higher education and vocational training, has developed a training program in the planning, writing, and production of radio and television public information and education programs. Two four-month courses are held each year. Only nationals of developing countries are admitted and given total financial support including fare to and from the Netherlands.

ORGANIZATION OF AMERICAN STATES, OAS (17th Street and Constitution Avenue, N.W., Washington, D.C. 20006) composed of North and South American countries, helps provide interested members with consultants, technical assistance, scholarship programs, equipment, and other related aspects of new educational programs using technology. The OAS is assisting the development of four regional centers -- in Argentina, Chile, Colombia, and Mexico -- that will provide training in and information about the application of educational television to specific problems.

RCA INSTITUTES, INC. (Correspondence & Residence Schools, 320 W. 31st St., New York, N.Y. 10001; TV Studio School, 1600 Broadway, New York, N.Y. 10017; Professional Educational Services, Front & Cooper Streets, Camden, New Jersey 08102; Spanish language correspondence courses; Avenida Mariano Escobedo 543, 20 Piso Apartado Postal 5-404, Mexico 5, D.F.) offers training in TV/Radio servicing, communications, industrial electronics, computer technology and programming.

RTV INTERNATIONAL INC. (405 Park Ave., New York, N.Y. 10022) is a consultant service which since 1962 has worked with Costa Rica, Ethiopia, India, Japan, Jordan, Kenya, Nigeria, Morocco, Thailand, Uganda, and Zambia on engineering, training, and software for radio and TV.

SCHOOL RESEARCH INFORMATION SERVICE (Phi Delta Kappa, 8th & Union, Bloomington, Indiana 47401) stores, retrieves, and disseminates reports of educational research and innovation. Elementary and secondary schooling emphasized.

SCIENCE INFORMATION EXCHANGE (209 Madison Bank Bldg., 1730 M Street, N.W., Washington, D.C. 20036) provides information about active science research programs. Financed by the National Science Foundation through grants to the Smithsonian Institution. Data provided to research institutions and investigators associated with recognized research organizations.

THOMSON FOUNDATION (York House, 37 Queen Square, London WC1 England) is an educational trust which annually provides two four-month courses for members of the production and engineering staff of recognized broadcasting organizations in developing countries. Applications are sent directly to the Foundation. The Foundation's instructors and training teams are available by invitation of the host country to assist with in-service training. Application for such assistance is channeled through overseas British Embassies and High Commissions.

UGANDA AUDIO-VISUAL AID CENTRE (National Institute of Education, Makerere University College, P.O. Box 7062, Kampala, Uganda) provides a slide library service, stencil services, and a library of tape recordings which are for sale. The Centre offers advisory services to anyone concerned with use of teaching aids in Uganda and welcomes the opportunity to cooperate with colleagues or Centers in other countries. The Centre provides a nine-month full-time Audio Visual Aids Technician's Course.

UNION INTERNATIONALE DES ASSOCIATIONS TECHNIQUES CINEMATOGRAPHIQUES (No. 92, Av. des Champs-Elysees, Paris, France) comprised of "official technical institutions, privately incorporated societies, and motion picture workers unions" from 21 nations. Purposes: information exchange, lectures, entertainment, encouragement of studies to advance techniques, and support of efforts for standardization.

UNION OF NATIONAL RADIO AND TELEVISION ORGANIZATIONS OF AFRICA (101 Rue Carnot, BP3237, Dakar, Senegal). An administrative Council composed of representatives of the broadcasting systems in Guinea, the Ivory Coast, Cameroon, Ghana, Nigeria, Senegal, Togo, Tunisia, and the United Arab Republic. Monitors the broadcasting frequencies of member organizations; measures the field intensity and the transmission frequencies of the different broadcasting stations of member organizations; participates in the research and measurements carried out by the different international broadcasting organizations.

UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION, UNESCO (Place de Fontenoy, Paris-7^{e}, France) seeks to develop the use of all types of media of communication for educational purposes. It has convened meetings of specialists from all countries, has issued publications on the use, development, and production of visual media, particularly in education. It assists various countries in promoting the use of such media, both on a national and on a regional scale, by means of conventions, scholarships, and expert assistance. There are UNESCO Regional Educational Planning Centers at New Dehli, India; Beirut, Lebanon; Dakar, Senegal; and Santiago, Chile.

A. (2) Software Information and Sources

It is possible to avoid much frustration and wasteful expense by writing for descriptive literature about program materials. Make sure you know the format, and that you are getting software with sound tracks and/or guide and workbook accessories in the language you require or with provisions for suitable translation.

Most of the sources listed here make available material for rent or purchase. Because it is often difficult to purchase materials in one country with the local currency of another, UNESCO has established a coupon plan. Its coupon office (Place de Fontenoy, Paris 7^{e}, France) helps institutions and individuals in UNESCO member states by selling UNESCO coupons for national currency at the official dollar rate on the day of sale. These coupons can then be used for purchasing -- from consenting parties -- publications, educational films, and scientific material from other countries.

AIMS INSTRUCTIONAL MEDIA SERVICES (5420 Melrose, Hollywood, California 90038) distributes over 500 color educational films for several cooperating producers, for primary, elementary, and secondary grades; available in 16 mm and on video tape. TV rights available.

AMERICAN EDUCATIONAL PUBLISHERS INSTITUTE, AEPI (432 Park Ave. South, New York,N.Y. 10016) publishes Instructional Materials for Urban Schools which lists over 1,000 titles from 60 firms by subject areas, giving title, author, producer, grade level, copyright data, medium, and format.

AMERICAN ASSOCIATION OF COLLEGES FOR TEACHER EDUCATION (1 Dupont Circle, N.W., Washington, D.C. 20036) has made videotape presentations to inform teachers and educators of innovations in undergraduate pre-service teacher preparation. Of considerable value is the program on microteaching, explained by Dwight W. Allen, showing controlled practice-teaching situations that afford opportunities for self-criticism, criticism by others, and improvement of supervisory techniques. Tapes run 42 to 52 minutes. Black-and-white. Distributor: Ampex Tape Exchange, 2201 Estes Ave., Elk Grove Village, Illinois 60007.

AMERICAN JOURNAL OF NURSING (Film Library, 267 W. 25th St., New York, N.Y. 10001; Visual Information Systems Center for Videotape, 15 Columbus Circle, New York, N.Y. 10023; programmed instruction units from Educational Services Division, 10 Columbus Circle, New York, N.Y. 10019) has catalog of films, filmstrips, 2x2 slides, video tapes, and programmed instruction for nursing education.

AMERICAN MEDICAL ASSOCIATION (Motion Picture Library, 535 North Dearborn St., Chicago, Illinois 60610) has many

16 mm films available on loan to medical societies, medical schools, hospitals, and other medical groups. Topics include basic sciences, clinical medicine and surgery, paramedical assistance, and numerous subjects for lay audiences.

AMTvB (10962 Le Conte Ave., Los Angeles, California 90024) has a program exchange for academic institutions only. For $100 annual dues, members receive the newsletter Intercom and a program catalog with over 200 titles. Most AMTvB producers lend 2" quad video tapes free when copies are available, and charge for dubbing, handling, and tape stock when other formats like 1" tape and 8 mm film are requested.

ASSOCIATION FOR EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY, AECT (1201 16th St., N.W., Washington, D.C. 20036) issued its Selected Sources of Materials in May 1971, listing 281 vendors of films, filmstrips, 2x2 slides, transparencies, records, prerecorded tapes, maps, globes, charts, models, and prints.

BRITISH NATIONAL FILM CATALOGUE (British National Film Catalogue, Ltd., 81 Dean Street W1 London, England).$21 per year.

BROADCAST INFORMATION BUREAU, INC. (51 E. 42nd St., New York, N.Y. 10017) issues TV "Free" Film Source Book (see p. 144).

BROADCASTING FOUNDATION OF AMERICA (52 Vanderbilt Ave., New York, N.Y. 10017) distributes international radio programs.

CBS ENTERPRISES, INC. (51 West 52nd St., New York, N.Y. 10019) is the international distribution headquarters for Bailey Film Associates which has a complete line of educational films dubbed into Japanese, Spanish, Portuguese, Italian, Swedish, French, and German. Dubbing is planned for additional languages on a regular basis. The distribution of these films is handled through a network of CBS foreign offices around the world.

CAEDMON RECORDS, INC. (505 8th Ave., New York, N.Y. 10018) has an extensive list of poetry readings, many by noted poets and actors.

CCM FILMS (866 Third Ave., New York, N.Y. 10022) distributes 16 mm films from Association/Sterling, Brandon Films, and Fleetwood Films. Sells curriculum and feature films, filmstrips and loops, slides, overhead transparencies. Also has some free loan film.

CENTER FOR CASSETTE STUDIES, INC. (8110 Webb Ave., North Hollywood, California 91600) sells audio cassettes. Has catalogs which list tapes of network broadcasts by scholars, statesmen, authors. Buyers authorized to make dubs without copyright violations.

COMMUNICATIONS RESOURCES EXCHANGE, CRE (12 North Drive, Malba, N.Y. 11357) distributes video tapes, films, and audio cassettes. Advises producers outside the U.S. on sales potential of planned programs. Makes studies. Contracts for film, TV production and revisions.

CONTEMPORARY/McGRAW-HILL FILMS (330 W. 42nd St., New York, N.Y. 10036) offers collection for sale or rent "from all over the world."

EALING CORPORATION (2225 Massachusetts Ave., Cambridge, Massachusetts 02140) makes, and sells for others, 8 mm and super 8 single concept films and film loops.

EAV-EDUCATIONAL AUDIO VISUAL INC. (Thornwood, New York 10594; also offices in London) distributes educational software including records, overhead transparencies, filmstrips, tapes, and slides.

EDUCATION DEVELOPMENT CENTER, EDC (55 Chapel Street, Newton, Massachusetts 02160) is a private, nonprofit corporation engaged in educational research and development. Conducts projects in the U. S. and overseas; responsible for the African Mathematics Program; and

Primary Science Programs. Sells instructional films.EDC's Their Man: A Course of Study is a fifth-grade social studies series being sold through regional and overseas centers by Curriculum Development Associates, Inc., 1211 Connecticut, Ave., N.W., Washington, D.C. 20036.

EDUCATIONAL DEVELOPMENT LABORATORIES (284 Pulaski Ave., Huntington, N.Y. 11744) has audio-slide-workbook programmed instruction materials designed to teach undereducated potential employees reading and numerical skills, typing and clerical skills.

EDUCATIONAL FILM LIBRARY ASSOCIATION, EFLA (17 West 60th St., New York, N.Y. 10023) consists of members who are producers, distributors, and users of educational films and filmstrips in public libraries, schools, colleges and universities, business, and industry. Since 1946 EFLA has evaluated more than 7,000 films. These evaluations are available on file cards and in a Film Evaluation Guide. EFLA issues a bimonthly journal, Sightlines; subject-area film lists; other publications; and sponsors the annual American Film Festival.

EDUCATIONAL MEDIA COUNCIL INC. (1346 Connecticut Ave., N.W., Washington, D. C. 20036) produces Educational Media Index, 13 vols. by subject and purposes. Vol. 14 is a Master Title Index. McGraw-Hill Publishing Co., 330 West 42nd St., New York, N.Y. $64.25 for the set.

EDUCATIONAL RECORDINGS LIBRARY (State University of New York, Thurlow Terrace, Albany, N.Y. 12201). Issues a "Mediagraphy" listing 60 films, audio and video tapes, and other media materials for remedial reading, with title, format, length, price, producer, and distributor. Free.

EDUCATIONAL RESOURCES FOUNDATION (2712 Millwood Ave., Columbia, South Carolina 29205) offers series for business, with video tapes on supervisory leadership, management by objectives, and sales skills. Their use by U.S. firms has reportedly reduced turnover and absenteeism. Video tape and film, with workbooks.

Educators Purchasing Master, Vol. II, Audio Visual is updated yearly. Lists producers, manufacturers, film libraries, and products. Fisher Publishing Co., 3 W. Princeton Ave., Englewood, Colorado 80110.

ENCYCLOPEDIA BRITANNICA EDUCATIONAL CORPORATION (425 North Michigan Ave., Chicago, Illinois 60611) is the world's largest distributor of classroom films and films for teacher education, guidance, and child development.

FILMS, INC. (1144 Wilmette Ave., Wilmette, Illinois 60091) holds certain international educational rights to works of Australian government, British Film Institute, Canadian Broadcasting Corp., Columbia Broadcasting System, Institut für Film und Bild, National Broadcasting Company, National Film Board of Canada, National Geographic Society, others. Many titles available for ETV broadcasts and closed circuit TV.

GENERAL LEARNING CORPORATION (5454 Wisconsin Ave., Chevy Chase, Maryland 20015) has audio tapes, books, films, records and science kits made for developing countries. Some elementary school publications are translated. Distributor: International Division, Silver Burdett Company, Morristown, New Jersey 07960.

GRADUATE EDUCATION NETWORK (801 Welch Rd., Palo Alto California 94304) makes and distributes color video tapes for graduate level scholars, presenting world renowned biochemists, physicists, and molecular biologists. Employs SECAM/60 system.

GREAT PLAINS NATIONAL INSTRUCTIONAL TELEVISION LIBRARY (University of Nebraska, Lincoln, Nebraska 68508) distributes telecourses at elementary, secondary, and college levels, teacher utilization, and in-service teacher education. Distributes the CETO Training Films on television production. (see CEDO, p. 122)

Teacher guides and study kits are available. The bulk of the material offered is available on lease, based on number and length of lessons, number of transmission points from which the signal is telecast, duration of use, and whether the user supplies video tape. Preview lessons are available without charge.

Horkheimer, May F., and John W. Diffor (eds), Educators Guide to Free Films, 29th ed., has over 5,000 titles. Twenty-four groupings from "Accident Prevention and Safety" through "Sports." Brief descriptions, no quality evaluations; formats; running times; in most cases, dates and whether it can be shown on TV. Indices give detailed breakdown by content, list of sources with percent of requests expected, insurance required on return shipments, and quotas on prints loaned to any school within a month. Order from: Educational Progress Service, Center Street, Randolph, Wisconsin, 53956, $9.50.

______, (eds.), Educators Guide to Free Filmstrips, 1968, 18th ed., lists and describes 446 filmstrips and 98 sets of slides. Same source. $7.

I/D/E/A, (Institute for Development of Educational Activities, P.O. Box 628, Far Hills Branch, Dayton, Ohio 45419) has 16 mm films on innovations in instruction to be used for in-service teacher education and community discussion. For sale or rent.

INDIANA UNIVERSITY AUDIO-VISUAL CENTER (Bloomington, Indiana 47401) sells and rents over 13,000 films produced by NET, Public Broadcasting Laboratories, and U.S. ETV stations. For inquiry about foreign language versions, write Field Services Dept., Indiana University A-V Center. 8 mm & super 8 versions available for all titles. Film Release Fact Sheets announce new releases. Previews is a quarterly cumulative list of recent releases.

INSTITUTO LATINOAMERICANO DE CINEMATOGRAFIA EDUCATIVA MEXICO-UNESCO, ILCE (Apartado Postal 18862, Mexico 18, D.F.) sells educational films for use in Latin America.

Johnson, Harry A. (ed.), Multi-Media Materials for Black Studies. LC 75-126009, 1970. Order from R.R. Bowker Company, 1180 Avenue of Americas, New York, N.Y. 10036.

KENYA SCHOOLS BROADCASTING DIVISION (Ministry of Education, Box 20456, Nairobi, Kenya) produces radio programs, and such accompanying material as pupils' pamphlets and teachers' handbooks on health education, East African natural history, geography, history, English, French and teacher training.

Kone, Grace Ann (ed.), 8 mm Film Directory, 1969-70. Published by EFLA (see p. 136); distributed by Comprehensive Service Corp., 250 W. 64th St., New York, N.Y. 10023. $8.50.

LEARNING CORPORATION OF AMERICA (711 Fifth Ave., New York, N.Y. 10022) has catalog of new films for sale and rental.

Library of Congress Catalogue of Motion Pictures and Filmstrips. Cumulative list. Available from Library of Congress, 1st Street, S.E., Washington, D. C. 20540. $25 per year.

McDaniel, Roderick, Resources for Learning, a core media collection for elementary schools. Annotated guide for K-6 listing 4,000 recommended titles, reviews, with information on media (8 mm, 16 mm, film, filmstrips, etc.), length, producer/distributor, price. LC 71-126024, 1971. Order from: R. R. Bowker Company, 1180 Avenue of Americas, New York, N.Y. 10036.

MODERN LEARNING AIDS EXPORT, (P.O. Box 1712, Rochester, New York, 14063) sells filmstrips, records, and cassettes through agents in the U.S. and abroad. Most material is in English; some of the science materials have soundtracks in French, German, Spanish, Swedish or Danish. With a sizeable minimum first order, films can be made available in any language.

NATIONAL AUDIO-VISUAL AIDS CENTER (254-256 Belsize Road, London NW6, England) is a centralized and authoritative source of information and advice on the use of audio-visual methods in education. It has an extensive demonstration center with a permanent display of a wide range of equipment, a software library, and a reference library of books, research reports and journals. It runs courses on the use of audio-visual techniques for education and training. An experimental unit reports on new equipment and teaching methods and conducts research.

NATIONAL AUDIO-VISUAL AIDS LIBRARY (Paxton Place, Gipsy Road, London, S.W. 27 England) houses a wide range of 16 mm films and film loops, 35 mm filmstrips, and a limited number of 2x2 slides. Available for purchase through the Educational Foundation for Visual Aids National Catalogue, 33 Queen Anne Street, London W1M OAL, England.

NATIONAL AUDIOVISUAL CENTER (National Archives and Records Service, Pennsylvania at 8th St., N.W., Washington, D.C. 20409) has for sale films and filmstrips made by or for agencies of the United States government.

NATIONAL COUNCIL FOR THE SOCIAL STUDIES (1201 16th St., N.W., Washington, D.C. 20036) offers film and videotape presentations on social studies curriculum, designed for department chairmen and teachers in elementary and secondary schools.

NATIONAL FILM BOARD OF CANADA (P.O. Box 6100, Montreal 3, Quebec, Canada) is the Canadian government agency which produces and distributes films, filmstrips, still photographs, and graphic materials designed to interpret Canada to Canadians and others. It is an international training center for technicians and educators in the production and use of visual aids.

NATIONAL INFORMATION CENTER ON EDUCATIONAL MEDIA, NICEM (University of Southern California, University Park, Los Angeles, California 90007) uses its computerized files to publish several directories:

Index to 16 mm Educational Films, 1969, 2nd ed. Over 30,000 available films. LC 71-91715. $39.50 in U.S., Canada; $43.50 elsewhere.

Indexed Overhead Transparencies, 1969. Over 18,000 items. LC 72-91715. $22.50 in U.S., Canada; $24.75 elsewhere.

Index to 8 mm Motion Picture Cartridges, 1969. Over 9,000 films and loops. LC 72-91715. $19.50 in U.S., Canada; $21.45 elsewhere.

Index to 35 mm Filmstrips, 1970, 2nd ed. c. 25,000 titles. LC 75-91714. $34 in U.S., Canada, $37.50 elsewhere.

NICEM Media Indexes are available from R.R. Bowker & Co., 1180 Avenue of the Americas, New York, N.Y. 10036.

NATIONAL LIBRARY OF MEDICINE (National Medical Audiovisual Center, Station K, Atlanta, Georgia 30324) has 1970 catalog with computerized loan system for short-term loans of films, filmstrips, audio and video tapes, and slide sets for the biomedical professions.

NATIONAL BROADCASTERS CORPORATION (NBC) EDUCATIONAL ENTERPRISES (30 Rockefeller Plaza, New York, N.Y. 10022) has 16 mm films for rent from NBC or from 18 university film libraries.

NATIONAL EDUCATIONAL TELEVISION, NET (10 Columbus Circle, New York, N.Y. 10019) introduces American viewers to foreign documentaries and, in turn, makes new NET programs available to foreign broadcasting organizations, including those of the developing nations.

NATIONAL INSTRUCTIONAL TELEVISION, NIT (Box A, Bloomington, Indiana 47401) develops television materials for American education. NIT develops and makes available for rental high quality television programs for kindergarten through high school, teacher in-service education, and offers 40 college courses. NIT tapes are normally available on quadruplex format and on Ampex 1" and 2" helical scan formats, but arrangements can be made to dub an NIT telecourse for other formats. A teacher's manual is provided for each telecourse, and student workbooks are available for some.

NETWORK FOR CONTINUING MEDICAL EDUCATION (15 Columbus Circle, New York, N.Y. 10023) issued its *NCME Master Videotape Library* catalog, 4th edition, in Spring 1971, listing over 500 programs on medical and paramedical subjects. Tapes are available for special viewing at modest charges for tape stock, duplication, shipping, and inspection after return. Supported by Roche Laboratories, which has messages about its products on each reel. Color or monochrome. Variety of VT formats.

NHK INTERNATIONAL (NHK Service Center, Inc., Shin-Nihon Building, Uchisaiwai-cho, Chiyoda-ku, Tokyo, Japan) is subsidiary of Nippon Hoso Kyokai, NHK, selling educational TV programs and segments in English, complete with teacher's manuals and full texts. Japan has the most extensive and advanced instructional television service in the world.

PAKISTAN AUDIO VISUAL AIDS SECTION (Central Bureau of Education, Ministry of Education and Scientific Research, Islamabad, Pakistan) prepares films and filmstrips, maintains hardware and software lending libraries, arranges teacher refresher courses on use of audio visual aids.

RADIO/FILM IMAGES (1034 Lake St., Oak Park, Illinois 60301) distributes films on arts and humanities, social sciences, natural sciences, films for children, and a large collection of cinema classics.

REGIONAL TECHNICAL AIDS CENTER, RTAC (Department of State, Agency for International Development, c/o American Embassy-Mexico City, Mexico and Buenos Aires, Argentina) provides Spanish language books and films, including educational materials, to USAID Missions for use by interested countries. RTAC film library prints have been cleared for screening over TV channels in Latin America. Catalogs of offerings are available to all Missions. Catalogs and materials are also available to interested groups and individuals.

RTV INTERNATIONAL, INC. (405 Park Ave., New York, N.Y. 10022) distributes programs for ten sources, among them Japan International TV Film Exchange, Paris TV, Artranca Park TV of Sydney, Australia and Science Films. Offices in Amman, Jordan; Beirut, Lebanon; Hong Kong.

Schneider, John M. and Barnett and Marsha Addis, Films in the Behavioral Sciences, 2nd ed., 1970. Annotated catalog lists 1,300 titles and their distributors. Order from: Behavioral Sciences Media Laboratory, Department of Psychiatry, University of Oklahoma Medical Center, Oklahoma City, Oklahoma.

SERINA PRESS (70 Kennedy St., Alexandria, Virginia 22305) publishes five directories:

Guide to Films About Famous People (16 mm) lists 1,450 films concerning well known, contemporary, and historical persons. LC 76-110326. $5.45.

Guide to Foreign Government-Loan Film (16 mm) contains over 3,000 films available from 68 foreign governments, 1,800 on free-loan, 1,200 at nominal fee. LC 70-91406.

Guide to Military-Loan Film (16 mm) has synopses of 1,430 films available on loan for free, non-profit showings. LC 76-81905. $4.95.

Guide to Government-Loan Film (16 mm) lists with synopses over 900 films of general interest and 2,000 of general professional interest from 53 federal agencies. LC 71-76544. $4.95.

Guide to State-Loan Film (16 mm) has synopses of 540 titles produced by or available through 60 agencies in 43 states and the District of Columbia, nearly all free. LC 75-96903. $1.95.

SINGAPORE ETV SERVICE (c/o Teachers' Training College, Paterson Road, Singapore, 9) records high quality television programs on video tape, mainly for Secondary I and II classes (12+ to 14+ years) and for technical training in English as a first and second language, math, science, and such technical subjects as mechanical drawing. Training is available for selected foreign personnel at the College. Singapore won top awards at the 1970 Japan Prize selections.

SMITH, KLINE & FRENCH LABORATORIES (1500 Spring Garden St., Philadelphia, Pennsylvania 19101) issues the SK&F Services Catalog 1970/1971 which lists 16 mm film prints on medicine, mental health, and nursing that may be borrowed free or at small service charges from listed distribution agencies. Certain 8 mm titles may be bought at cost.

Spaulding, Seth (compiler), Programmed Instruction, an International Directory, 1967. UNESCO, The International Education Clearinghouse, Place de Fontenoy, 75 Paris 7^e France.

SQUIBB FILM LIBRARY (745 Fifth Ave., New York, N.Y. 10022) lends titles on 17 subject areas without cost to the medical profession.

TRANS-TEL (5 Köln 1, Gertrudenstrasse 30-36, West Germany) dubs and distributes German films for developing countries, through sale when possible, but on occasion without charge or at reduced fees. Write the Director.

Television Factbook (see p. 174). Section titled "Directory of TV Program Sources and Services" contains companies supplying animated films, newsreels, religious films, TV film/tape series, music libraries, slides, stock footage, and TV rights. It also lists companies which distribute industrial and educational films on lease or loan.

TV "Free" Film Source Book. Lists educational, industrial, religious, public relations, and documentary films provided free or on a "nominal fee basis" by manufacturers, foundations, government bureaus, and other organizations. Order from: Broadcast Information Bureau, 51 E. 42nd St., New York, N.Y. 10017. $35.

UNITED NATIONS TELEVISION (866 United Nations Plaza, New York, N.Y. 10017) provides the International Zone series of 130 programs, many in color, on international cooperation in education, health, aviation, atomic energy, food supply, weather forecasting, economics, space exploration and other topics, with material of historic import from UN archives and from film shot on special assignment in many parts of the world, and UN Report, 16 half-hour 16 mm in black-and-white.

U.S. Department of Health, Education & Welfare, Washington, D.C. 20205, Catalogue of Captioned Films for the Deaf. Two volumes listing films of major U.S. distributors which have captions in English for use by deaf persons. Films have lesson guides.

VIDEO NURSING (2834 Central Ave., Evanston, Illinois 60201) provides instructional tapes for in-service nurse training.

Weber, Olga S., (ed.), Audiovisual Market Place. A multimedia guide. Names, addresses, key people, product lines for 846 software producers and 310 hardware manufacturers; national, professional, and trade associations; educational TV and radio stations, some of which lend, rent or sell programs; information on review, contract production, and cataloging services; bibliography of reference works; calendar of exhibitions and festivals. LC 69-18201.

New York: R.R. Bowker & Co., 1971. $12.25 in U.S., Canada; $13.50 elsewhere.

WESTERN INSTRUCTIONAL TELEVISION (1541 N. Vine St., Los Angeles, California 90028) has widely-used video-tape series for elementary and intermediate grades on one and two inch tape. Available in color or monochrome.

WESTINGHOUSE LEARNING CORPORATION (100 Park Ave., New York, N.Y. 10017) has issued a seven-volume Learning Directory listing over 200,000 items from 1,000 commercial and nonprofit sources, organized into 46 media descriptions including books, filmstrips, maps, audio tapes, 8 mm and 16 mm films, games, discovery learning kits, video tapes, and multi-media packages. 1970. $90.

WESTON WOODS (Weston, Connecticut 06880) produces slide films, with and without sound, based on children's books.

Wittich, Walter A. and Gertie A. Halsted, Educators Guide to Free Tapes, Scripts, and Transcriptions. Lists 49 tapes, 116 scripts, and 116 transcriptions on such subjects as conservation, guidance, health, education, homemaking, language arts, music, science, and social studies. Order from: Educational Progress Service, Center Street, Randolph, Wisconsin 53956. $6.75.

WORLD COUNCIL OF CHURCHES (Film and Visual Arts Section, 150, route de Ferney, 1211 Geneva 20, Switzerland) produces films and arranges world-wide exchange and distribution. Plans are underway for establishing a cataloging service with emphasis on films concerning development.

A. (3) Hardware Information

ASSOCIATION FOR EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY, ACET, (1201 16th St., N.W., Washington, D.C. 20036) issued its "Selected Sources of Hardware" in May 1971, listing 187 vendors of 8 mm, 16 mm, 35 mm, 2x2, and overhead projectors, TV systems and/or equipment, language laboratories, tape recorders and duplicators, record players and radios, programmed instruction and learning systems, remote access and media control systems, projection tables, cabinets, study carrels, projection screens and light control.

EDUCATIONAL PRODUCTS INFORMATION EXCHANGE INSTITUTE, EPIE (386 Park Ave., South, New York, N.Y. 10016) is a non-profit agency established to gather, codify, and disseminate dependable information about specifications, critical characteristics, and actual school performance of instructional materials, equipment, and systems. Its studies are published in its monthly Educational Product Report, and is available by subscription. Of special value are its product reports on programmed instruction, 8mm projectors, and videotape recorders. (see p. 168 & 176)

Educators Purchasing Master, Vol. II. (see p. 136)

NATIONAL AUDIO-VISUAL ASSOCIATION, NAVA (3150 Spring St., Fairfax, Virginia 22030). Education is a major NAVA interest, reflected in its biweekly NAVA News; its annual Audio-Visual Equipment Directory ($8.50 but $7.00 each when prepaid for 10 or more copies); regular reports on educational legislation; other publications; and its annual convention and trade show. (see p.148)

Pfannkuch, Robert B., "Before You Sign a Purchase Order." This vendor, who has designed and installed video systems for major U.S. companies, spells out precautions a buyer should take before issuing confirmation of what he is buying. Educational Television, March 1971, pp. 30-31. (See p. 176 for ordering details)

Weber, Olga S. (ed.), Audiovisual Market Place, a multimedia guide. This directory is as useful for equipment references. (see p.144)

A. (4) Professional and Trade Associations

AMERICAN LIBRARY ASSOCIATION, ALA (50 East Huron Street, Chicago, Illinois 60611) is an organization of 26,000 librarians, library trustees, and other friends of libraries in the U.S. and other countries. Instructional technology is of growing concern, with activities focused in the program of its Audio-Visual Committee. The Association publishes a monthly journal, as do several of its 14 Divisions; and makes available books, reports, films, filmstrips, etc. on library technology.

ASSOCIATION FOR EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY, AECT (1201 Sixteenth St., N.W., Washington, D.C. 20036) is an affiliate of the National Education Association (formerly its Department of Audiovisual Instruction) and a professional association of audiovisual specialists and other educators concerned with instructional resources. AECT issues the monthly Audiovisual Instruction, the quarterly AV Communications Review, and frequent special reports and books as well as audiovisual materials on instructional technology. Its annual convention, with extensive exhibits of equipment and materials and an elaborate program covering many timely aspects of instructional technology, offers special hospitality to international visitors.

ASSOCIATION OF ELECTRONIC MANUFACTURERS, INC. (100 S. Wacker Dr., Chicago, Illinois 60606)

ASSOCIATION OF FEDERAL COMMUNICATIONS CONSULTING ENGINEERS, AFCCE,(527 Munsey Building, Washington, D.C. 20004)

ASSOCIATION FOR BROADCASTING ENGINEERS STANDARDS, INC. (1730 M St., N.W., Washington, D.C. 20036)

AUDIO ENGINEERING SOCIETY, INC. (60 East 42nd St., New York, N.Y. 10017).

Audio Visual Source Directory, semi-annual, "services and products," Motion Picture Enterprises Publications, Tarrytown, New York 10591. $2.50.

Motion Picture Theater Directory, Ibid, $2.50.

ELECTRONIC INDUSTRIES ASSOCIATION (2001 I St., N.W., Washington, D. C. 20036) is a trade association of 300 U.S. manufacturers of electronic equipment and components. It provides legislative services, engineering, market and industry data for member companies, and publishes a $15 yearbook summarizing international industry trends.

HEALTH SCIENCES COMMUNICATIONS ASSOCIATION (Box 3163, Duke University Medical Center, Durham, North Carolina 27706). Formerly the Council on Medical Television consisting of medical communications specialists, publishes periodic bulletins, holds annual conference.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, IEEE (345 East 47th St., New York, N.Y. 10017)

NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS, NAEB. (see p. 128)

NATIONAL AUDIO-VISUAL ASSOCIATION, NAVA (3150 Spring St., Fairfax, Virginia 22030) is the U.S. national trade association of the audio-visual industry with a membership including dealers selling A-V equipment and materials, dealers with film rental libraries, manufacturers of A-V equipment, producers of films, and other A-V services. (see p.146)

NATIONAL INDUSTRIAL TELEVISION ASSOCIATION (P.O. Box 228, E. Orange, New Jersey 07019) aims to develop uniform technical standards and "to provide a primary channel among users, suppliers, distributors, and manufacturers."

NATIONAL SOCIETY FOR PROGRAMMED INSTRUCTION, NSPI (Trinity University, 715 Stadium Dr., San Antonio, Texas 78212) is a professional association of educators and trainers. A growing number of educators around the world receive the monthly NSPI Journal and attend the annual convention.

SOCIETY OF BROADCAST ENGINEERS (P.O. Box 88123, Indianapolis, Indiana 46208)

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS, INC. SMPTE, (9 E. 41st St., New York, N.Y. 10017). Members are engineers, scientists, and technicians from every branch of the motion picture, television, instrumentation, and high-speed photography industries. Through the Society they are able to keep abreast of current technology and contribute to technological advancements and education in these fields. All members receive the journal. Annual dues: active and associate, $25; junior associate, $20; student, $5. (see p. 178)

A. (5) Financial Assistance: Sources and Information

Listed below are some of the largest agencies actively concerned with giving financial assistance to educational reform projects around the world. Most of them also offer technical assistance. Because all have unique modes of operation -- forms in which proposals must be made; ways in which financial assistance can be obtained -- they must be consulted individually.

AFRICAN DEVELOPMENT BANK, Banque Africaine de Developpement (B.P. 1387, Abidjan, Ivory Coast) serves continental Africa and the African Islands with a current membership of 31 independent African states. Its purpose is to contribute to the economic development and social progress of its members -- individually and jointly; to promote the investment of public and private capital in Africa; to use its normal capital resources to make or guarantee loans and investments; and to provide technical assistance in the preparation, financing, and implementation of development projects, including those concerned with updating education systems through curriculum reform, uses of technology, etc.

ASIA FOUNDATION (550 Kearny Street, San Francisco, California 94108) is a private, nonprofit, philanthropic organization which supports Asian educational, social, and cultural development. It sponsors local programs, travel grants, conferences, and seminars, and provides consultants and advisers.

ASIAN DEVELOPMENT BANK (Commercial Center, P.O. Box 126, Makati, Rizal D-708, Philippines) is an international development finance institution with 21 regional members and 13 non-regional members. It was established to lend funds, promote investment, provide technical assistance to developing member countries, and generally to foster economic growth and cooperation in the Asian Region. The Bank may also initiate plans for possible courses of action in financing certain projects involving both training and education.

BUNDESMINISTERIUM FÜR WIRTSCHAFTLICHE ZUSAMMENARBEIT (5300 Bonn, Kaiserstrasse 185-201),the West German federal agency for general international economic aid, including technical assistance. Address the Bundersminister.

EUROPEAN DEVELOPMENT FUND (23-27 Avenue de la Joyeuse Entree, Brussels 4, Belgium) is administered by the Commission of the European Communities on behalf of the six countries of the European Economic Community. Its purpose is to increase trade; to promote economic and social development among the Non-European Associates of the European Community with special emphasis on creating viable infrastructure, rural development, health, and education. The Non-European Associates comprise 17 African states plus Madagascar and 13 other overseas countries and departments.

EXPORT-IMPORT BANK OF THE UNITED STATES (811 Vermont Ave., N.W., Washington, D.C. 20005) is said to be the largest source of overseas financing and banking. Education oriented, including educational television, it has a staff unit for most regions and many countries.

THE FORD FOUNDATION (320 E. 43rd St., New York, N.Y. 10017) is a private, nonprofit institution which seeks to identify and contribute to the solution of problems of national and international importance and works principally by granting funds to institutions, talented individuals, and communities for experimental, demonstration, and developmental efforts within its fields of interest. It has representatives in Asia, the Middle East, Africa, Latin America, and the Caribbean.

THE FOUNDATION CENTER (444 Madison Ave., New York, N.Y. 10022) assembles and disseminates information about foundations. It does not make recommendations as to likely sources of funds, but publishes Foundation News six times a year listing grants. $6 per year.

INSTITUTE OF INTERNATIONAL EDUCATION, IIE (809 United Nations Plaza, New York, N.Y. 10017) is a private, nonprofit organization which administers public and private grants that enable U.S. students to study abroad and foreign students to study in the U.S. It maintains an information reference and publication service on international education. The IIE has regional offices outside the U.S.; the Nairobi office maintains an information center about educational developments in Ethiopia, Kenya, Malawi, Tanzania, Uganda, and Zambia.

INTER-AMERICAN DEVELOPMENT BANK (808 17th Street, N.W., Washington, D.C. 20577) is a regional hemispheric agency consisting of 22 member nations of the Inter-American system. Its purpose is to accelerate the development of its member countries, individually and collectively. The Bank promotes the investment of public and private capital for development purposes, including education, and provides technical assistance for the preparation, financing, and implementation of development plans and projects such as study of priorities and formulation of specific project proposals.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (see World Bank Group, p. 153)

INTERNATIONAL DEVELOPMENT ASSOCIATION, IDA. (see World Bank Group, p. 153)

JOHN AND MARY R. MARKLE FOUNDATION (50 Rockefeller Plaza, New York, N.Y. 10020) is a private, nonprofit philanthropic organization. In 1969 it began a new program to strengthen the educational uses of mass media and communications technology. Among the foundation's interests are television, radio, newspapers, magazines, books, and film.

Lewis, Marianna O. (ed.), The Foundation Directory, 1971, 4th ed. Issued approximately every three years. Lists funds available by fields of interest, among them geographic regions, international activities. Order from Columbia University Press, 136 S. Broadway, Irvington-on-Hudson, New York 10533, $15.

MINISTRY OF COMMERCE, STATE OF ISRAEL (30 Agron Blvd., Jerusalem). Encourages private commercial assistance for developing education. Write Mr. Zeev Birger, at the Ministry.

NATIONAL COUNCIL FOR EDUCATIONAL TECHNOLOGY, NCET (160 Great Portland Street, London W1, England) is an independent charitable trust which encourages research and development projects in education and training, with special concern for equipment and materials.

OVERSEAS PRIVATE INVESTMENT CORPORATION, OPIC (U.S. Department of State, Washington, D.C. 20520) is a government corporation charged with stimulating the investment of private U.S. capital in development of lesser-developed countries. It also provides technical assistance for projects in the developing countries on behalf of the Agency for International Development and other agencies.

UNITED NATIONS DEVELOPMENT PROGRAM, UNDP (United Nations Secretariat, New York, N.Y. 10017) is the central technical assistance and development assistance agency of the United Nations system.

WORLD BANK GROUP (1818 H Street, N.W., Washington, D.C. 20433) is a term used to describe three international institutions with the common goal of helping their member countries to develop their economies.

> The International Bank for Reconstruction and Development (World Bank), owned by 110 member countries, makes loans on conventional terms to help finance projects that will contribute to a country's progress: roads, electric plants, schools, agricultural development, industry, and the like.
>
> The International Development Association, IDA owned by 102 member countries, engages in activities identical to those of the Bank but its loans are made on highly concessionary terms. These "credits" go to the poorest of the developing countries -- those which cannot afford to borrow on conventional terms.
>
> The International Finance Corporation, IFC with 91 members, invests in private enterprise without government guarantee. Investments by IFC are usually in the form of loans combined with purchase of stock.

B

APPENDIX B: Bibliography

This appendix consists of a selected list of material, both published and unpublished,* that could be of interest to countries considering new plans for education and especially the use of technology.

These sections follow:

(1) Educational Planning and the Development Process

(2) Educational Media

  a. Audio-Visual Aids

  b. Radio, Broadcast, and Closed-Circuit Television

  c. Programmed Learning

  d. Satellites

(3) Selected Reading on Technology in Developed Countries

(4) Periodicals and Bibliographies of General Interest

*Unpublished documents can be obtained from the person or institution under whose auspices they were written.

B. (1) Educational Planning and Use of Media

Barnouw, Erik, Mass Communications: Television, Radio Film & Press. A clear, well-organized introduction to mass communications taking a realistic, practical, pragmatic view. New York: Holt, Rinehart, & Winston, Inc., 1956, $6.50.

Bloom, Benjamin S. (ed.), Taxonomy of Educational Objectives, Handbook I: Cognitive Domain. Covers six groupings of cognitive behavior applicable to diverse grade levels, subjects, and school situations. New York: Longmans, Green, 1956.

Bretz, Rudy, The Selection of Appropriate Communication Media for Instruction. Describes media for 11 instructional uses, giving criteria for determining what systems are needed. Order from The Rand Corporation, Communications Dept., 1700 Main St., Santa Monica, California 90406, 1971,$3.

Educational Media Inc. (809 Industrial Way, Ellensburg, Washington 98926). For facilities planning: color sound filmstrips on large group teaching auditoriums, television utilization in education, computer-assisted instruction, and music listening systems. Color sound filmstrip with study guide $6, strip with magnetic tape and audible chain signal. $11.

Emery, Walter B., National and International Systems of Broadcasting: Their History, Operation and Control. Order from Michigan State University, East Lansing, Michigan 48933, 1969, $12.50.

Gagne, Robert M., The Conditions of Learning. Considered a classic. New York: Holt, Rinehart & Winston, Inc. Text ed., 1965, $7.50.

Gerlach, Vernon S. and Donald P. Ely, Teaching and Media: A Systematic Approach. Guide to use of media to generate individual participation and response. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971.

Hayman, John L., Jr., Research in Education. A clear, simple statement on how to go about doing educational research. Columbus, Ohio: Charles E. Merrill Publishing Co., 1968.

Hicks, Warren B. and Alma May Tillin, Developing Multi-Media Libraries. On procedures for selection, acquisition, cataloging, processing, and storage, with examples on handling 29 kinds of material from art prints to video tape. Written to show how book-based library skills can be adapted to handle A-V materials. LC 72-112397. New York: R.R. Bowker & Co., 1970. $8.95 in U.S., Canada; $9.85 elsewhere.

John, Laurence Henry, and William D. Hickman, "Telecommunications" which appeared in Britannica Book of the Year, 1971. Succinct 1970 overview of government activity, research activity, satellites, cable and radio, computers and data transmission, and telephone. Chicago: Encyclopedia Britannica, Inc., 1971.

Krathwohl, D.R., B.J. Bloom, and B.B. Masia, Taxonomy of Educational Objectives, Handbook II; Affective Domain. Part I describes part of education concerned with learning attitudes, values, and motives. Part II organizes the objectives into a detailed hierarcy with ways to measure and evaluate each level. New York: David McKay Co., 1964.

Mager, Robert, Goofing Off with Objectives, 16mm film in which Mr. Mager shows that basically sound principles can easily be misapplied and thereby become self-defeating. Order from South Carolina ETV Network, 2712 Millwood Ave., Columbia, South Carolina 29205.

Monroe, W.S. (ed.), Encyclopedia of Educational Research, 3rd ed. Summaries on state of art, each article followed by bibliography of important studies on its topic, organized by areas of educational practice. New York: The Macmillan Co., 1960.

New England Educational Assessment Project, Guide to Assessment and Evaluation Procedures. Workbook, in stages: pre-testing and experimental design before pupils take part, evaluation when they participate, then summary and analysis of data. Glossary and bibliography. Blank charts, too. Order from NEEAP, Roger Williams Bldg., Hayes St., Providence, Rhode Island 02908, 1966.

Pfeiffer, John E. *New Look at Education: Systems Analysis in Our Schools and Colleges*. Statement of purposes and reasons for the "Systems approach," which can be too easily promised, largely confined to paper, and become a new cliche. New York: Odyssey Press, 1967. Paper, $1.

Schramm, Wilbur (ed.), *The Process and Effects of Mass Communication*. Collection of articles by some of the best known authorities. Order from University of Illinois Press, Urbana, Illinois 61801.

Schramm, W., P.H. Coombs, F. Kahnert, and J. Lyle, *The New Media*: *Memo to Educational Planners*. Based on USIS contract research, discusses problems new media are being used to solve, how effective they are proving to be, how they are used, their cost, and planning for their use. Summary report of a series of four volumes, Institute for Educational Planning, UNESCO, Place de Fontenoy, 75 Paris 7^{e}, 1967.

_____________, *New Educational Media in Action*: *Case Studies for Planners*. Vols. I, II, and III of a series of four volumes. Institute for Educational Planning, UNESCO, Place de Fontenoy, 75 Paris 7^{e}, France, 1967.

Scriven, Michael, *The Methodology of Evaluation*, AERA (American Educational Research Association) Monograph #1 Series on Curriculum Evaluation. Chicago: Rand McNally & Co., 1967.

Siepmann, Charles A., *Communications and Education*. Thirty half-hour programs on the relations of mass media to education and society, which won a first place 1968 Ohio State Institute for Education by Radio-Television

Award. Produced by the New York State Education Department and WNDT-TV, New York, the series is distributed outside New York state by Great Plains National ITV Library (see p. 136), available on 2" quad video tape and 16 mm kinescope, black-and-white.

_______________"ITV in Perspective." Siepmann, who directed programs for BBC and wrote the FCC "blue book" on the social responsibilities of broadcasters, isolates some widely forgotten fundamentals. Educational Television, January 1970, pp. 11-13 (See page 176 for address of magazine).

______________"The Sleeping Giant -- ITV in Higher Education." Proposes sweeping reform in terms of contemporary ideas and needs of contemporary life. Educational Television, May 1970, pp. 13-15, 20 (See page 176 for address of magazine).

Sullivan, Peggy A., Problems in School Media Management. Case studies to familiarize library people with administrative, organizational, and technical factors in school media programs. LC 78-126323. New York: R.R. Bowker & Co., July 1971. $9.95 in the U.S., $10.95 elsewhere.

Wittrock, M.C. and David E. Wiley (eds.), The Evaluation of Instruction. Useful for planning the assessment of learning results. New York: Holt, Rinehart & Winston, Inc., 1970.

B. (2) Educational Media

a. Audio-Visual Aids

Audio Visual Associates (P.O. Box 324 Monterey Park, California 91754), Film Review Index. Provides indexed reference to thousands of reviews and evaluations of educational and informational films published in library and media journals. Three quarterly issues and annual compilations. $50 for 1970 and 1971. $25 per year for duration of standing order.

Bollman, Charles G., "The 8 mm Format: A Status Report." Analyzes silent and sound regular 8 and Super 8, and fully examines the many features -- including cost -- to be considered when buying a projector. Educational Product Report, December 1968-January 1969. $10 to non-members. (See p. 176 for address of magazine).

Burder, John, Technique of Editing 16 mm. Films. Step by step, detailed instruction for young professionals, film units in industry, and advanced amateurs. New York: Hastings House Publishers, Inc., 1968. $9.50.

DAVI and American Association of School Librarians, Standards for Media Programs, 1969. Supersedes 1960 School Library Standards and 1961 Audio-visual Standards. Yardsticks to assess resources and facilities, staffing, personnel and services, selection, accessibility and organization of materials for schools with unified media programs or with separate library and A-V centers. Order from Publications Sales Division, National Education Association, 1201 16th St., N.W., Washington, D.C. 20036.

Kellogg, Edward W., The ABC of Photographic Sound Recording. SMPTE MP-25. SMPTE, 9 E. 41st St., New York, N.Y. 10017. $1. (see p. 149)

Kirkpatrick, Herman H., How to Use Photography as a Science Teaching Aid. Gives examples of classroom phototechniques to go with a science curriculum. Lists books, booklets, magazines, and film references. Order from Science Teachers Association, 1201 16th Street, N.W., Washington, D.C. 20036. 35¢ per copy.

Levitan, Eli L., An Alphabetical Guide to Motion Picture, Television and Videotape Production. Summary of production techniques. Good reference charts and tables of equipment, processes, and techniques for professional and educational users. New York: McGraw-Hill, Inc., 1970. $24.50.

MacCann, Richard Dyer, Good Reading about Motion Pictures. Annotated bibliography of books on film history, theory,

criticism, writing and techniques. SMPTE, MP-17. SMPTE, 9 E. 41st St., New York, N.Y. 10017. No charge. (see p. 149).

Manoogian, Haig P., The Film-Maker's Art. A practical handbook demonstrating how values and theories can be translated into film. A 50-page appendix shows progress from first draft through third and final shooting script. Glossary, bibliography. New York: Basic Books, Inc., 1966. $7.50.

Miller, A.C. and W. Strenge (eds.), American Cinematographer's Manual, 3rd ed. Technical handbook for professionals. List of terms in five languages. Many charts and tables. American Society of Cinematographers Holding Corporation. (see p. 174).

National Slide Library of Audio-Visual Media in Education. 366 2x2 color slides show audio equipment, overhead projection, films, filmstrips, slides, TV, charts, visual boards, carrels, and multi-media in use at school, college, and adult levels. Suited for presentations to decision-makers, teachers, and community groups. By inserting your slides, you can localize content. Order from National Audio-Visual Association, 3130 Spring Street, Fairfax, Virginia 22030. $65, or $62.50 if payment accompanies order. (see p. 146).

Parker, Norton S., Audio-Visual Scriptwriting. Has most of the fundamentals: how to lay out film and TV scrips, and to handle such special factors as sound and optical effects. Oriented to educational and documentary production. Covers use of stock footage, narration, titles, special effects. New Brunswick, New Jersey: Rutgers University Press, 1968. $12.50.

Pyramid Films, Basic Film Terms: A Visual Dictionary on 16mm Film. 15 minutes. Pyramid Films, Box 1048, Santa Monica, California 90406. Sale, $175; rent, $18.

Reisz, Karel and Gavin Millar, Technique of Film Editing, enlarged edition. The standard theoretical work, updated since 1958 publication in England. New York: Hastings House Publishers, Inc. Cloth $13.50; paper $7.20.

Society of Motion Picture and Television Engineers, Inc., Motion Picture Technical Terms in Five Languages. English, Spanish, French, Italian, and German. SMPTE, MP-18, 1950. 9 E 41st St., New York, N.Y. 10017. Single copy free; $1 for five copies (see p. 149)

___________, Test Film Catalog. Lists and describes test films and slides, with prices. MP-10. SMPTE, 9 E. 41st St., New York, N.Y. 10017. Free (see p. 149)

Spottiswoode, Raymond, Film and its Techniques. A classic text and reference for student practitioners. Order from University of California Press, Berkeley, California, 1951. $8.50.

3M Company, Better Communications Through Tape. How-to-do-it guide for users of audio recording in business and education. Mechanical operation, maintenance, accessories, and check-lists for using portable tape recorders. Order from Products Division, 3M Company, St. Paul, Minnesota 55101. Free.

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Weber, Olga S., Audiovisual Market Place. (see p. 144)

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Flory, John and William H. Allen, Designing New Apparatus for Learning. Survey of needs and developments in audio-visual devices suitable for educational use. LC 63-21301. Available in mimeo through SMPTE, 9 E. 41st St., New York, N.Y. 10017. (see p. 149).

b. Radio, Broadcast, and Closed-Circuit Television

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American Radio Relay League, Course in Radio Fundamentals, $1, and Radio Amateur's Handbook, revised annually, $4. Good exposition of essential technical information. ARRL, 225 Main St., Newington, Connecticut 06111.

Benson, K. Blair, Monochrome Test Patterns for Television. TV-7, SMPTE, 9 E. 41st Street, New York, N.Y. 10017. Free. (see p. 149)

Bretz, Rudy, Techniques of Television Production, 2nd ed. A standard text. Has been translated into Japanese and Arabic. New York: McGraw-Hill, Inc., 1962. $12.50.

CEDO Television Training Films. Twenty 16mm films on the fundamentals of such topics as graphics, sound, lighting, lenses, special effects, animation, and floor management. Lengths range from 16 to 32 minutes, mostly black and white. U.S., Canada rights held by Great Plains National Library. (see p. 136 for address); elsewhere through CEDO (see p. 122 for address).

Coffelt, Kenneth, Basic Design and Utilization of Instructional Television. Non-technical guide for users. Order from Instructional Media Center, University of Texas at Austin, Austin, Texas 78712, 1971. $2.50.

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Fiorentino, Imero, "Lighting," Educational Television, February 1970, pp. 26-27. (see p. 176 for address of magazine).

Frost, J. M. (ed.), World Radio-TV Handbook, 24 ed., 1970. Nation-by-nation listing of radio and TV stations, frequencies, personnel, and summary of programming. Order from: Soliljevej 44, 2650 Hvidovre, Denmark; 7 Carnaby Street, London WIV 1PG; 165 W. 46th Street, New York, N.Y. 10036.

Gattegno, Caleb, Towards a Visual Culture: Educating Through Television. A prophet, critic, and creative experimenter states how TV can catalyze learning. New York: Outerbridge & Dienstfrey, 1969. $4.95.

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Gill, George H., Sr. (chairman, sub-committee), TV Studio Lighting Nomenclature. TV-3. SMPTE, 9 E. 41st St., New York, N. Y. 10017. No charge. (see p. 149)

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AV Communication Review. Quarterly. Emphasizes digests of research and reviews. Association for Educational Communications and Technology, 1201 16th St., N.W., Washington, D.C. 20036.

Audio-visual Communications. Nine times a year. United Business Publications, 200 Madison Ave., New York, N.Y. 10016. $8 a year in U.S., $10 in Canada, $12 elsewhere.

Audio Visual Media/Moyens Audio-Visuels. Quarterly. Journal of the International Council for the Advancement of A-V Media in Education. Text in English and French. Pergamon Press, Inc. Headington Hill Hall, Oxford OX3 0BW, United Kingdom.

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Bolex Reporter. Biannual. Has fine material on film and TV production techniques. Paillard, Inc., 1900 Lower Rd., Linden, New Jersey 07036. $2 for four issues.

Braille Technical Press. Monthly. Radio-electronics technical magazine for the blind. 980 Waring Ave., Bronx, New York 10469.

Canadian Training Methods. Bimonthly. Chesswood House Publishing Co., 4420 Chesswood Dr., Toronto, Ontario. $5 per year, $7 two years.

1971 Directory & Yearbook of Educational Broadcasting. The 1970 edition has a better list of general reference material on pp. 71-73 than current issue. National Association of Educational Broadcasters, 1346 Connecticut Ave., N.W., Washington, D.C. 20036. $5.50.

Educational Broadcasting International. Quarterly journal of the Centre for Educational Development Overseas. Published by Wynn Williams, Ltd., Centenary Buildings, King Street, Wrexham, United Kingdom. United Kingdom institutions £5, individuals £ 3.50; U.S. and Canada institutions $12.50, individuals $10.

Educational Broadcasting Review. Bimonthly. National Association of Educational Broadcasters in conjunction with Ohio State University, Columbus, Ohio. NAEB, 1346 Connecticut Ave., N.W., Washington, D.C. 20036. Office: 2470 N. Star Rd., Columbus, Ohio 43221. $6 per year.

EBU Review Special issues on educational broadcasting in European countries and other continents. Separate English and French editions: Part A (technical) six times a year, EBU Technical Centre, 32 avenue Albert Lancaster, Brussels, Belgium; Part B (general and legal) published alternate months by Educational Broadcasting Review, Administrative Office, 1 rue de Varembe, 1211 Geneva 20, Switzerland.

Educational/Instructional Broadcasting. Monthly except July and August. Acolyte Publications, Inc., 825 S. Barrington Ave., Los Angeles, California 90049. $3 for each issue. In U.S., Canada, $20 per year; $35 for two years; $45 for three years. Other countries: $40 per year; $70 for two years; $90 for three years.

Educational Product Report. September-June. Membership service of the Educational Products Information Exchange Institute (EPIE), 386 Park Ave., South, New York, N.Y. 10016. Membership rate $35 per year. Added single reports $3 each. Non-member subscription rate $45.

Educational Technology. Monthly. Highly regarded. 140 Sylvan Ave., Englewood Cliffs, New Jersey 07632. $18 per year in U.S., $21 elsewhere.

Educational Television. Monthly. Descriptive articles on uses of TV in schools, colleges, medical centers, industry, military units, and public television stations. Emphasizes measurable effectiveness, innovative and interesting work. Lay interpretations of research. Sections on materials cleared for television, literature, new products. 607 Main St., Ridgefield, Connecticut 06877. $8 per year in U.S., $10 Canada, $12 elsewhere.

Educational Television International. Quarterly. Pergamon Press, Inc., 44-01 21st St., Long Island City, New York 11102. $15 per year.

Educators Guide to Media and Methods. Nine times per year, September thru May. Probably the most lively and best-edited magazine on multi-media materials and their uses. 134 N. 13th St., Philadelphia, Pennsylvania 19107. $15 for three years; add $2 for outside the U.S.

ETV Newsletter. Biweekly, with up-to-date information on new software. C.S. Tepfer Publishing Co., 607 Main St., Ridgefield, Connecticut 06887. $40 per year.

Film Library Quarterly. Film Information Library Council, 101 W. Putnam Ave., Greenwich, Connecticut 06830. $8 per year to non-members.

Film News. Six times a year. An international review of A-V materials and equipment. 250 W. 57th St., New York, N.Y. 10018. $6 in U.S., Canada; $7 elsewhere.

Filmmakers Newsletter. Monthly. Practical information for all interested in film. Lists film festivals, seminars, study groups, fund sources and distributors's outlets. 80 Wooster St., New York, N.Y. 10012. In U.S., $4.50; Canada and Mexico, $5.50; $7.50 elsewhere.

Focal Encyclopedia of Film and Television Techniques. 10,000 indexed references. Sections on animation, cameras, satellite communications. Notable section by Raymond Spottiswoode, "Film and Television -- A Basic Anatomy." London and New York: Hastings House Publishers, Inc., 1969. $37.50.

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Journal of the Audio Engineering Society. Quarterly. 60 East 42nd St., New York, N.Y. 10017.

Journal of Broadcasting. Quarterly. Issued by the Association for Professional Broadcasting Education, 1717 N St., N.W., Washington, D.C. 20036. Membership at $8.50 includes subscription, available at $6 or $3 for students.

Journal of Educational Technology. Concerned with theory, applications, and development, learning psychology, AV methods, curriculum, information theory, instructional materials production, cost effectiveness, and educational environments. Councils & Educational Press, Ltd., 10 Queen Anne St., London, W1M 9LD, England. $10 per year.

Journal of the Society of Motion Picture and Television Engineers. Monthly plus special issues. The leading technical periodical covering film and TV standards, new developments and practices. All members of SMPTE receive journal. Subscription only: $26 per year in U.S., $27 elsewhere. (see p. 149)

Journal of the University Film Association. Quarterly. Department of Photography, Motion Picture Division, Ohio State University, 1885 Neil Ave., Columbus, Ohio 43210.

Mass Media/Adult Education. Processed newsletter containing data on new programs, studies, projects. 363 Arps Hall, Ohio State University, Columbus, Ohio 43221. $3 per year.

Modern Media Teacher. Five issues per year. 38 W. 5th St., Dayton, Ohio 45402. $5 per year in U.S.; $7.50 in Canada and foreign.

Sight and Sound. Quarterly. British Film Institute, 81 Dean St., London W1; U.S. Address: 155 W. 15th St., New York, N.Y. 10041. $4 per year.

Standard Periodical Directory, 3rd ed., 1970. LC 64-7598. Oxbridge Publishing Co., 420 Lexington Ave., New York, N.Y. 10017.

"A Suggested ETV Bibliography 1967-69." Educational Television International, June 1970, pp. 161-164. (see CEDO, p. 122).

Telecommunications Journal. Monthly. Printed in English, French, and Spanish. International Telecommunications Union, Platz des Nations, Geneva. 25 frs. per year.

Television et Education. Three times a year. Cultural et Television, 27 rue Cassette, Paris 6, France. 15 frs. for 4 issues in France, 18 frs. elsewhere.

The Listener. Weekly. A most literate and incisive publication for the broadcast audience. British Broadcasting Corporation, 35 Marylebone High St., London, W1M 4AA. 1s 3d per copy; 82s 6d per year.

Training and Development Journal. Monthly. Issued by the American Society for Training and Development. Devoted to skills instruction and management development. 517 N. Segoe Rd., Madison, Wisconsin 53705.

Training in Business and Industry. Monthly. Contains reports on uses of films, programmed instruction, audio and video tapes for employees. Gellert Publishing Corporation, 33 W. 60th St., New York, N.Y. 10023. Sent free to corporate specialists, administrators, and consultants. Others subscribe in U.S. and Canada at $10 per year, $15 two years, $20 three years; elsewhere at $15 per year.

Ulrich's International Periodicals Directory, 13th ed., 1969. 2 vols. LC 32-16320. R.R. Bowker & Co., 1180 Avenue of the Americas, New York, N.Y. 10036. $34.50 in U.S., Canada; $37.95 elsewhere.

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Videoplay Report. Biweekly. Newsletter on video cassettes and cartridges. C.S. Tepfer Publishing Co., 607 Main St., Ridgefield, Connecticut 06877. $40 per year.

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Weiss, Frederic, Sources of Information on World and International Radio and Television. A directory of publishers and professional agencies concerned with broadcast news, propaganda, regulation, educational and national development. Basic library of 25 books listed. Mass Communication Program, Indiana University, 419 N. Indiana, Bloomington, Indiana 47401. Free.